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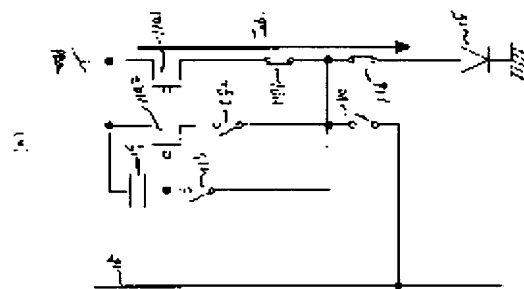
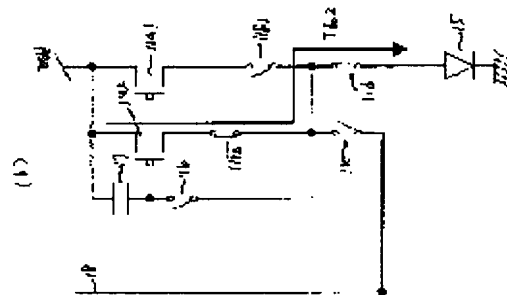
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(54) METHOD FOR DRIVING EL DISPLAY DEVICE, AND EL DISPLAY DEVICE AND INFORMATION DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an EL display device without dispersion in brightness in a display plane.

SOLUTION: In each pixel, a TFT 11a1 and a TFT 11a2 for driving use are formed. The two TFT 11a share a gate terminal. The current I_w from a source signal line 18 is programmed in a capacitor 19. In a 1st field, a TFT 11f1 is brought into ON state, and a current I_{dd1} is made to flow through an EL element 15. The EL element emits light with brightness corresponding to I_{dd1} . In a 2nd field, a TFT 11f2 is brought into ON state, and a current I_{dd2} is made to flow through the EL element 15. The EL element 15 emits light with brightness corresponding to I_{dd2} . Since a program current is $I_w = I_{dd1} + I_{dd2}$, an average light emitting brightness of the EL element 15 in the two fields corresponds to a half of the program current I_w .



Drawings are not displayable due to the volume of the data (more than 200 drawings).

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CLAIMS

[Claim(s)]

[Claim 1]It is shown in an EL display, and a pixel is arranged at matrix form, and to said each pixel An EL element, An EL display, wherein a drive transistor element which impresses current to said EL element, a capacitor which carries out prescribed period maintenance of the gate terminal voltage of said drive transistor element, and a switching element which short-circuits both ends of said capacitor are formed.

[Claim 2]It is shown in an active-matrix type EL display which has a source signal line which a pixel is arranged at matrix form and transmits a video signal, and to said each pixel An EL element, A drive transistor element which impresses current to said EL element, and the 1st capacitor that carries out prescribed period maintenance of the gate terminal voltage of said drive transistor element, The 2nd capacitor connected to said capacitor in series, and the 1st switching element that impresses a signal of a source signal line to said capacitor, An EL display, wherein said 1st [the] and the 2nd switching element that short-circuits both ends of at least one capacitor among the 2nd capacitor are formed.

[Claim 3]An EL display comprising:

It is shown in an EL display and is an EL element.

The 1st which impresses current to said EL element, and the 2nd drive transistor element.

Said 1st drive transistor element and the 1st switching element that turns on and off current between said EL elements.

A capacitor connected with said 2nd drive transistor element, the 2nd switching element that turns on and off current between said EL elements, and a gate terminal of said 1st drive transistor element [of a gate terminal of the 2nd drive transistor element] in the first half.

[Claim 4]An information display device providing an EL display panel characterized by comprising the following, a down converter, an up converter, a receiver, and a speaker, and synchronizing with said 1st drive transistor, said 2nd drive transistor, and the field, and making it operate by turns.

An EL element.

The 1st which impresses current to said EL element, and the 2nd drive transistor element.

Said 1st drive transistor element and the 1st switching element that turns on and off current between said EL elements.

A capacitor connected with said 2nd drive transistor element, the 2nd switching element that turns on and off current between said EL elements, and a gate terminal of said 1st drive transistor element [of a gate terminal of the 2nd drive transistor element] in the first half.

[Claim 5]An EL display comprising:

It is shown in an EL display and is an EL element.

The 1st which impresses current to said EL element, and the 2nd drive transistor element.

Said 1st drive transistor element and the 1st switching element that turns on and off current between said EL elements.

Said 2nd drive transistor element and the 2nd switching element that turns on and off current between said EL elements, A capacitor connected with a gate terminal of said 1st drive transistor element [of a gate terminal of the 2nd drive transistor element] in the first half, Said 1st drive transistor and the 2nd drive transistor, the 3rd transistor that has a relation of a current mirror circuit, and a switching element which impresses voltage of a source signal line to a gate terminal of said 3rd transistor.

[Claim 6]A drive method of an EL display which is provided with the following and characterized by performing periodically said 1st operation, said 2nd operation, and said 3rd operation.

1st operation that writes the same voltage in a gate terminal of the 1st and 2nd drive transistor elements, and makes a prescribed period and said voltage hold.

2nd operation that impresses current which said 1st drive transistor element sends in the 1st period to an EL element, and makes said EL element emit light.

3rd operation that impresses current which said 2nd drive transistor element sends in the 2nd period to an EL element, and makes said EL element emit light.

[Claim 7]An EL display, wherein it has the following, and the 1st drive transistor of an even number pixel row and the 2nd drive transistor of an odd number pixel row approach, and are arranged and the 1st signal wire and 2nd signal wire are arranged at said even number pixel row and said odd-pixel spacing.

It is shown in an EL display and is the 1st drive transistor of an even number pixel row.

The 2nd drive transistor of an odd number pixel row.

The 1st switching element that programs said 1st drive transistor.

The 2nd switching element that programs said 2nd drive transistor, the 1st signal wire that controls said 1st drive transistor, and the 2nd signal wire that controls said 2nd drive transistor.

[Claim 8]The 1st operation that is a drive method of an EL display and writes the same data in a drive transistor of the 1st pixel row and a drive transistor of the 2nd pixel row which adjoined in the 1st field, In [carry out with the 2nd operation that changes said 1st pixel row into an astigmatism light state, and the 3rd operation that shifts at a time two pixel rows of pixel rows which write in said data, and] the 2nd next field of said 1st field, The 1st operation that writes the same data in a drive transistor of the 1st pixel row and a drive transistor of the 2nd pixel row which adjoined, A drive method of an EL display carrying out with the 2nd operation that changes said 2nd pixel row into an astigmatism light state, and the 3rd operation that shifts at a time two pixel rows of pixel rows which write in said data.

[Claim 9]Are a drive method of an EL display in which an EL element and a drive transistor were formed in each pixel, and it synchronizes with a Horizontal Synchronizing signal, A drive method of an EL display, wherein current which a pixel row is programmed, and a pixel row programmed is shifted one by one, and is impressed to said EL element is turned on and off in a period shorter than a horizontal scanning period.

[Claim 10]An EL display comprising:

It is an EL element to each pixel.

A drive transistor which impresses current to said EL element.

The 1st switching element that constitutes a course of program current to said drive transistor.

The 1st gate signal line that transmits a signal which the 2nd switching element that turns on and off current which flows into said EL element from said drive transistor is formed [signal], and makes said 1st switching element turn on and off, The 2nd gate signal line that transmits a signal which makes said 2nd switching element turn on and off, The 1st shift register to which said two or more 1st gate signal lines are connected to, and an ON-state-voltage position is shifted among said two or more 1st gate signal lines, and the 2nd shift register to which said two or more 2nd gate signal lines are connected to, and an ON-state-voltage position is shifted among said two or more 2nd gate signal lines.

[Claim 11]Are a drive method of an EL display and to an EL display. A drive transistor which impresses current to each pixel at an EL element and said EL element, The 1st switching element that constitutes a course of program current to said drive transistor, The 2nd switching element that turns on and off current which flows into said EL element from said drive transistor, The 1st gate signal line that transmits a signal which makes said 1st switching element turn on and off, A standup of a signal which the 2nd gate signal line that transmits a signal which makes said 2nd switching element turn on and off is formed, and is impressed to said 1st gate signal line, A drive method of an EL display driving so that falling of a signal impressed to said 2nd gate signal line may be in agreement.

[Claim 12]Are a drive method of an EL display and to an EL display. A drive transistor which impresses current to each pixel at an EL element and said EL element, The 1st switching element that constitutes a course of program current to said drive transistor, The 2nd switching element that turns on and off current which flows into said EL element from said drive transistor, The 1st gate signal line that transmits a signal which makes said 1st switching element turn on and off, A signal which the 2nd gate signal line that transmits a signal which makes said 2nd switching element turn on and off is formed, and is impressed to the 2nd gate signal line of the 1st pixel row, A drive method of an EL display, wherein a signal impressed to the 2nd gate signal line of said 1st pixel row and the 2nd pixel row that adjoined is an opposite phase.

[Claim 13]The 1st gate signal line that is a drive method of an EL display and chooses a pixel, By providing the 2nd gate signal line that intercepts current to an EL element of said pixel, and impressing OFF state voltage to said 2nd gate signal line of a pixel by which selection voltage was impressed to said 1st gate signal line, Said 2nd gate signal line of the 1st operation that intercepts current to said EL element, and a pixel to which said selection voltage is not impressed carries out 2nd operation that impresses ON state voltage and OFF state voltage by turns, A drive method of an EL display, wherein position of a signal standup position of said 2nd gate signal line of said pixel row and signal falling of the 2nd gate signal line of a pixel row which adjoined said pixel row abbreviated-corresponds.

[Claim 14]The 1st gate signal line that is a drive method of an EL display and chooses a pixel, By providing the 2nd gate signal line that intercepts current to an EL element of said pixel, and impressing OFF state voltage to said 2nd gate signal line of a pixel by which selection voltage was impressed to said 1st gate signal line, Said 2nd gate signal line of the 1st operation that intercepts current to said EL element, and a pixel to which said selection voltage is not impressed, Said 2nd gate signal line of the 2nd operation that impresses ON state voltage or OFF state voltage for every horizontal scanning period on the basis of a Vertical Synchronizing signal, and a pixel to which said selection voltage is not impressed, In a horizontal scanning period which carried out 3rd operation that reverses timing which impresses ON state voltage or OFF state voltage for every horizontal scanning period for every frame and when a signal of said 2nd gate signal line continued, A drive method of an EL display impressing so that ON state voltage or OFF state voltage may continue.

[Claim 15]It is shown in an EL display which has the 2nd gate signal line that intercepts current to an EL element of a pixel, Separate into the 1st period and 2nd period same in abbreviation, and one horizontal scanning period to said 2nd gate signal line of an even number pixel row. A drive method of an EL display impressing a signal which intercepts current to said EL element to said 1st period, and impressing a signal which intercepts current to said EL element in said 2nd period to said 2nd gate signal line of an odd number pixel row.

[Claim 16]It is shown in an EL display which has the 2nd gate signal line that intercepts current to an EL element of a pixel, and the 1st gate signal line that impresses reverse bias voltage to said EL element, A phase of a signal which impresses a signal which impresses reverse bias voltage at said EL element to said 1st gate signal line, and is impressed to said 2nd gate signal line at the 1st gate signal line of said 1st pixel row, A drive method of an EL display which a phase of a signal impressed to the 1st gate signal line of the 2nd pixel row that adjoined said 1st pixel row is an opposite phase, and is characterized by carrying out a periodic change.

[Claim 17]The 1st operation to which it is a drive method of an EL display which performs current programming to a pixel, image data is shifted to, and a size of image data is changed, A drive method of an EL display carrying out the 2nd operation that impresses current corresponding to a size of said image data to said pixel, and 3rd operation that impresses current corresponding to a size of image data of said origin to said pixel.

[Claim 18]An EL display, wherein said concave refraction part is filled up with a different refractive-index material from a

concave refraction part which was formed on an electrode formed on EL film, a sealing film formed on said electrode, and said sealing film, and was formed corresponding to a pixel, and said concave refraction part.

[Claim 19]An EL display comprising:

The 1st picture element electrode formed in matrix form.

A bank formed between said 1st picture element electrode.

The 2nd picture element electrode formed so that said 1st picture element electrode might be contacted, and so that it might lap on said bank.

A common electrode formed on EL film formed on said 2nd picture element electrode, and said EL film.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]the EL display panel of this invention which displays a picture mainly with spontaneous light -- and it is related with information display devices, such as a cellular phone using these EL display panels, etc.

[0002]

[Description of the Prior Art]Since many liquid crystal display panels to a portable equipment etc. are adopted from the advantage of low power consumption with a thin shape, they are used for apparatus, such as a word processor, a personal computer, television (TV), the viewfinder of a video camera, a monitor, etc.

[0003]

[Problem(s) to be Solved by the Invention]However, since liquid crystal display panels are not spontaneous optical devices, there is a problem that it cannot be displayed that a picture does not use a back light. Since predetermined thickness was required in order to constitute a back light, there was a problem that the thickness of a display module became thick. In order for a liquid crystal display panel to perform a colored presentation, it is necessary to use a light filter. Therefore, there was a problem that efficiency for light utilization was low. It is shown in an EL display, [0004]

[Means for Solving the Problem]In order to solve an aforementioned problem, this invention is arranged at matrix form and a pixel to said each pixel An EL element, It is an EL display, wherein a drive transistor element which impresses current to said EL element, a capacitor which carries out prescribed period maintenance of the gate terminal voltage of said drive transistor element, and a switching element which short-circuits both ends of said capacitor are formed.

[0005]

[Embodiment of the Invention]In order that each drawing may draw an understanding easily in this specification, there are an abbreviation or/and a part which carried out scaling. For example, with the sectional view of the display panel of drawing 7, the sealing film 73 etc. are illustrated thickly enough. In drawing 1, thin film transistors (TFT) which impress a signal to a picture element electrode are omitted. It is desirable to omit the phase films for phase compensation etc., etc. and for ** to add timely in the display panel of this invention. The above thing is the same also to the following drawings. The part which attached the same number or the sign has a same or similar gestalt, material, a function, or operation.

[0006]Especially the contents explained with each drawing are combinable with other examples, even if there is no notice. For example, a touch panel etc. can be added to the display panel of drawing 1, and it can be considered as drawing 19 and the drawing 49 information display device. A magnifying lens can be attached and viewfinders (refer to drawing 45), such as a video camera (refer to drawing 44), can also be constituted. The drive method of this invention explained with drawing 31, drawing 51, Drawing 104, Drawing 106, etc. is applicable to which display or display panel of this invention. It cannot be overemphasized that it cannot be limited to this although this invention mainly explains the active-matrix type display panel in which TFT was formed in each pixel, and it can apply also to a simple matrix type.

[0007]Thus, even if not illustrated in particular in the specification, the matter, contents, and specification which were indicated or explained in the specification and the drawing can be combined mutually, and can be indicated to a claim. It is because it is impossible to describe all the combination on specifications etc.

[0008]The organic electroluminescence display panel which is low power consumption, is high indication quality, and also is constituted by arranging the plurality of an organic electroluminescence (EL) element to matrix form as a display panel which can be slimmed down attracts attention.

[0009]As an organic electroluminescence display panel is shown in drawing 4, the organic stratum functionale (EL layer) 47 of at least one layer which consists of an electron transport layer, a luminous layer, an electron hole transporting bed, etc. on the glass plate 49 (array substrate) with which the transparent electrode 48 as a picture element electrode was formed, and the metal electrode (reflection film) 46 are laminated. The organic stratum functionale (EL layer) 47 emits light by applying the voltage of plus and the minus to the negative pole (cathode) of the metal electrode (reflector) 46 to the anode (anode) of the transparent electrode (picture element electrode) 48, namely, impressing a direct current between the transparent electrode 48 and the metal electrode 46. By using the organic compound which can expect a good luminescent characteristic for the organic stratum functionale, an EL display panel can be equal to practical use.

[0010]A cathode terminal, an anode electrode, or a reflection film may form and constitute the optical interference film which becomes an ITO electrode from a dielectric multilayer. A dielectric multilayer forms the dielectric film of a low refractive index, and the dielectric film of a high refractive index in a multilayer by turns. That is, it is a dielectric mirror. This dielectric multilayer has a function which makes good the color tone of the light emitted from organic electroluminescence structure (screen effect). Other materials, such as IZO, may be sufficient as ITO. This matter is the same also to a picture element electrode.

[0011]Big current flows into the wiring 51 and 63 which supplies current to an anode or a cathode. For example, if the screen size of an EL display turns into 40 inch sizes, about [100A] current will flow. Therefore, it is necessary to produce the resistance of these wiring low enough. By this invention, wiring of an anode etc. is first formed with a thin film to this technical

problem. And the thickness of a conductor is thickly formed in this thin film wiring with electrolysis plating art. The wiring itself or the metallic wiring which turns into wiring from **** is added if needed.

[0012]In order to supply big current to an anode or cathode wiring, it wires from a current supply source means to the neighborhood, such as said anode wiring, with the power wiring of a small current by high tension, and the low voltage and high electric current are converted the power and supplied using a DCDC converter etc. That is, it wires from a power supply to a power consumption object with high tension and small current wiring, and changes into a high current and the low voltage the neighborhood [for power consumption]. A DCDC converter, a transformer, etc. are illustrated as such a thing.

[0013]It is preferred to use for the metal electrode 46 what has small work functions, such as lithium, silver, aluminum, magnesium, indium, copper, or each alloy. It is preferred to use an aluminum-Li alloy especially, for example. A big conductive material or gold of a work function, such as ITO, etc. can be used for the transparent electrode 48. When gold is used as an electrode material, an electrode will be in a translucent state. Other materials, such as IZO, may be sufficient as ITO. This matter is the same also to a picture element electrode.

[0014]When vapor-depositing a thin film to the picture element electrode 46 etc., it is good to form an organic electroluminescence film in argon atmosphere. By forming a carbon film at 20 or more nm [50] or less on ITO as the picture element electrode 46, the stability of an interface improves and light emitting luminance and luminous efficiency will also become good.

[0015]It cannot be overemphasized that it may not limit to forming EL film by vacuum evaporation, and may form by an ink jet.

[0016]Hereafter, in order to make easy an understanding of the EL display panel structure of this invention, the manufacturing method of the organic electroluminescence display panel of this invention is explained first.

[0017]In order to improve heat dissipation nature of the substrate 49, it may form with sapphire glass. A thermally conductive good thin film or thick film may be formed. For example, using the substrate in which diamond membrane (DLC etc.) was formed is illustrated. Of course, a quartz glass substrate and a soda glass substrate may be used. In addition, that which used ceramic substrates, such as alumina, or used the metal plate which consists of copper etc. or by which vacuum evaporation or spreading coated the insulator layer with the metal membrane may be used. When using a picture element electrode as a reflection type, since light is emitted from the direction of the surface of a substrate as a substrate material, in addition to the transparence thru/or translucent material of glass, quartz, resin, etc., impermeable material, such as stainless steel, can also be used. This composition is illustrated to drawing 7. The cathode terminal is formed with the transparent electrodes 72, such as ITO.

[0018]Although it presupposed that a cathode etc. are formed with a metal membrane in the example of this invention, it may not limit to this and may form by transparent membranes, such as ITO and IZO. Thus, a transparent EL display panel can be constituted by using the electrode of both the anode of EL element 15, and a cathode as a transparent electrode. By raising transmissivity to about 80%, without using a metal membrane, displaying a character and a picture, it can constitute so that the other side of a display panel may almost be transparent and it may be visible.

[0019]It cannot be overemphasized that a substrate may use a plastic plate. It can be hard to break a plastic plate, and since it is lightweight, it is the optimal as a substrate for display panels of a cellular phone. As for a plastic plate, it is preferred to paste an auxiliary substrate together to one field of the base board used as a core material with adhesives, and to use as a laminated circuit board. Of course, these substrate 321 grades may not be limited to a board, and a with a 0.3 mm or less 0.05 mm or more thickness film may be sufficient as them.

[0020]As a substrate of a base board, it is preferred to use alicyclic polyolefin resin. A single board with a thickness of 200 micrometers of ARTON by Japan Synthetic Rubber Co., Ltd. is illustrated as such alicyclic polyolefin resin. The hard court layer which has heat resistance, solvent resistance, or a moisture permeability-proof function in one field of a base board, And the substrate (or a film or a film) of the assistance which consists of polyester resin, polyethylene resin, or polyether sulfone resin etc. in which the gas barrier layer with an infiltrative-proof function was formed is arranged.

[0021]When it constitutes the substrate 49 from a plastic as mentioned above, the substrate 49 consists of a base board and an auxiliary substrate. The auxiliary substrate (or a film or a film) which consists of polyether sulfone resin etc. in which the hard court layer and the gas barrier layer were formed in the field of another side of a base board like the above-mentioned is arranged. It is preferred to make it the angle of the optical lagging axis of an auxiliary substrate and the optical lagging axis of an auxiliary substrate to make turn into 90 degrees. A base board and an auxiliary substrate are pasted together via adhesives or a binder, and let them be a laminated circuit board.

[0022]It is preferred to use as adhesives what consists of acrylic resin with UV (ultraviolet rays) hardening type. As for an acrylic resin, it is preferred to use what has a fluorine group. In addition, the adhesives or the binder of an epoxy system may be used. As for the refractive index of adhesives or a binder, it is preferred to use or more 1.47 1.54 or less thing. It is preferred to make it refractive index difference with the refractive index of the substrate 49 become 0.03 or less. especially -- adhesives -- previously -- written **** -- it is preferred to add optical dispersing agents, such as titanium oxide [like], and to make it function as a light scattering layer.

[0023]When pasting an auxiliary substrate and an auxiliary substrate together to a base board, it is preferred to make into 120 degrees or less the angle which the optical lagging axis of an auxiliary substrate and the optical lagging axis of an auxiliary substrate make 45 degrees or more. It is good to make it still more desirable 100 degrees or less 80 degrees or more. By using this range, the phase contrast generated with polyether sulfone resin etc. which are an auxiliary substrate and an auxiliary substrate can be thoroughly negated within a laminated circuit board. Therefore, the plastic plate for display panels can be treated now as an isotropic substrate without phase contrast. Therefore, the nonuniformity of the display panel by phase states differing does not occur with the composition which uses a circular light board.

[0024]By this composition, flexibility spreads remarkably compared with a film substrate or a film laminated circuit board with phase contrast. That is, it is because linear polarization can be changed into elliptical polarization by combining a phase difference film as a design. If there is phase contrast in the substrate 49 etc., an error with a designed value will occur according to this phase contrast.

[0025]Here, as a hard court layer, polyester resin, epoxy system resin, urethane system resin, or acrylic resin can be used, and the 1st undercoat layer of a transparent conducting film is served both as a stripe like electrode or a picture element electrode.

[0026]As a gas barrier layer, organic materials, such as inorganic materials, such as SiO₂ and SiO_x, or poly vinyl alcohol, and

polyimide, etc. can be used. As a binder, adhesives, etc., epoxy adhesive, polyester system adhesives, etc. other than acrylic which were described previously can be used. The thickness of a glue line shall be 100 micrometers or less. However, in order to smooth unevenness of the surfaces, such as a substrate, it is preferred to be referred to as not less than 10 micrometers.

[0027]It is preferred to use a with a not less than 40-micrometer thickness [400 micrometer] thing as the auxiliary substrate and auxiliary substrate which constitute the substrate 49. The unevenness or phase contrast at the time of melting extrusion molding called the die line of polyether sulfone resin can be low suppressed by the thickness of an auxiliary substrate and an auxiliary substrate being 120 micrometers or less. Preferably, the thickness of an auxiliary substrate shall be not less than 50 micrometers 80 micrometers or less.

[0028]Next, SiO_x is formed in this laminated circuit board as an auxiliary undercoat layer of a transparent conducting film, and the transparent conducting film which consists of ITO which serves as a picture element electrode if needed is formed with weld slag art. An ITO film is formed as a static free if needed. Thus, the transparent conducting film of the manufactured plastic plate for display panels can realize sheet-resistance-values 25ohm/**, and 80% of transmissivity as the membrane characteristics.

[0029]In the thickness of a base board, 50 to 100 micrometers when thin, in the manufacturing process of a display panel, the plastic plate for display panels will curl by heat treatment. A good result is not obtained in connection of a circuit component. When a base board is not less than 200-micrometer500 micrometers or less in thickness with a single board, there is no modification of a substrate and it excels in smooth nature, and conveyance nature is good and, as for the transparent conducting film characteristic, is stabilized. Connection of a circuit component can also be made satisfactorily. As for especially thickness, not less than 250 micrometers 450 micrometers or less are good. It thinks because it has moderate pliability and smoothness. Other materials, such as IZO, may be sufficient as ITO. This matter is the same also to a picture element electrode.

[0030]When using organic materials, such as the above-mentioned plastic plate, as the substrate 49, it is preferred to form the thin film which consists of inorganic materials as a barrier layer also in the field which touches a light modulation layer. As for the barrier layer which consists of this inorganic material, forming with an AIR coat and an identical material is preferred. It cannot be overemphasized that the sealing substrate 41 as well as the substrate 49 is producible by art or composition.

[0031]When forming a barrier film on a picture element electrode or a stripe like electrode, in order to reduce the loss of the voltage impressed to a light modulation layer as much as possible, it is preferred to use a low dielectric constant material. For example, the amorphous carbon film (specific inductive capacity 2.0-2.5) which added fluoride is illustrated. In addition, the LKD series (LKD-T200 series (specific inductive capacity 2.5-2.7), LKD-T400 series (specific inductive capacity 2.0-2.2)) which JSR is manufacturing and selling is illustrated. LKD series is the spin spreading type which used MSQ (methy-silsesquioxane) as the base, and its specific inductive capacity is also low [as 2.0-2.7] preferred. In addition, inorganic materials, such as organic materials, such as polyimide, urethane, and an acrylic, SiN_x, SiO₂, may be sufficient. It cannot be overemphasized that such barrier film materials may be used for an auxiliary substrate.

[0032]By using the substrate 49 formed with the plastic, or 41, the advantage that it cannot divide and that a weight saving can be carried out can be demonstrated. There are also other advantages that press working of sheet metal can be carried out. That is, the substrate of arbitrary shape is producible by press working of sheet metal or cutting (see drawing 25). Arbitrary shape and thickness are processible by fusion or chemicals processing. For example, forming circularly, making it globular forms (curved surface etc.), or processing conical shape is illustrated. By press working of sheet metal, the unevenness 252 can be formed in one substrates face, and, simultaneously with manufacture of a substrate, formation of the diffusing surface or embossing can be performed.

[0033]It is also easy to form in the hole of the substrate 41 formed by carrying out press working of sheet metal of the plastic so that a back light or the gage pin of a cover substrate can be inserted. Electric circuits formed by thick film technique or a thin film technology in the substrate 49 and 41, such as a capacitor or resistance, may be constituted. By forming a crevice (not shown) in the substrate 41, forming the heights 251 in the substrate 49, and forming so that these crevice and heights can be inserted in exactly, it may constitute so that the substrate 41 and the substrate 49 can be unified by insertion.

[0034]When a glass substrate was used, the bank used when vapor-depositing EL to the periphery of the pixel 16 was formed. A bank (rib) is formed in the shape of heights using a resin material by 1.0-micrometer or more a thickness of 3.5 micrometers or less. It forms in not less than 1.5-micrometer a height of 2.5 micrometers or less still more preferably. ***** — the bank (heights) 251 which consists of resin — formation of the substrate 41 or 49 — simultaneously, it is also producible. SOG material besides an acrylic resin and polyimide resin may be sufficient as bank material. When a bank carries out press working of sheet metal of the substrate 41 or the substrate 49, it forms the heights 251 of resin simultaneously (see drawing 25). This is a big effect generated by forming the substrates 41 and 49 by resin.

[0035]Thus, since production time can be shortened by forming a resin part simultaneously with a substrate, low-cost-izing is possible. The heights 251 are formed in dot form at a display area part at the time of manufacture of the substrate 49 etc. These heights 251 are good to form between adjacent pixels. These heights 251 hold the predetermined space of the substrate 41 and the substrate 49. Stripe shape besides the shape of ** which encloses a picture element electrode may be sufficient as bank shape.

[0036]Although it presupposed that the heights 251 which function as a bank are formed in the above example, it does not limit to this. For example, it is good also as investigating a picture element part by press working of sheet metal etc. (crevice). Formation forms the uneven part 252 and the heights 251 simultaneously with a substrate, and also a flat surface substrate is formed first and the method which presses by reheating and forms unevenness is contained after that.

[0037]The light filter of mosaic shape may be formed by coloring the substrates 41 and 49 directly. Art, such as ink jet printing, is used for a substrate, and a color, coloring matter, etc. are applied and are made to permeate. It is made to dry at an elevated temperature after osmosis, and what is necessary is just to cover the surface with inorganic materials, such as resin, such as UV resin, silicon oxide, or nitrogen oxide. A film is applied with gravure printing technique, offset-printing art, and a spinner, and a light filter is formed with the semiconductor pattern formation art etc. to develop. A black matrix (BM) may be directly formed by being [it / using art / in the relation between a dark color, black, or the complementary color of the light to modulate besides a light filter]-similarly coloring. A crevice may be formed so that it may correspond to a pixel in a substrates face, and it may constitute so that a light filter, BM, or TFT may be embedded in this crevice. It is preferred to carry out the tunic especially of

the surface with an acrylic resin. With this composition, there is also an advantage that flattening of the picture element electrode side etc. is carried out.

[0038]Resin of a substrate face may be electric-conduction-ized by a conductive polymer etc., and a picture element electrode or a cathode terminal may be constituted directly. A hole is made in a substrate still more greatly and the composition which inserts electronic parts, such as a capacitor, in this hole is also illustrated. The advantage which a substrate can constitute thinly is demonstrated.

[0039]A pattern may be freely formed by cutting the surface of a substrate. It may form by melting the periphery of the substrates 41 and 49. In the case of an organic electroluminescence display panel, the periphery of a substrate may be melted and closed in order to prevent penetration of the moisture from the outside.

[0040]As mentioned above, the drilling process to a substrate is easy by forming a substrate by resin. Press working of sheet metal etc. can constitute substrate shape freely. A hole can be made in the substrates 41 and 49, this hole can be filled up with electric conduction resin etc., and it can also be made to flow through the table and the reverse side of a substrate electrically. The substrates 41 and 49 can use as a multilayered circuit board or a double-sided board.

[0041]A current-carrying pin etc. may be inserted instead of electric conduction resin. It may constitute so that the terminal of electronic parts, such as a capacitor, can be fitted over the formed hole. The circuit wiring by a thin film, a capacitor, a coil, or resistance may be formed in a substrate. That is, it is good also considering the substrate 41 and 49 self as a multilayer wiring board. Multilayering consists of those of pasting a thin substrate together. One or more of the substrates (film) to stretch may be colored.

[0042]A color and coloring matter are added to a substrate material, it can be colored the substrate itself or a filter can be formed. A serial number can also be formed simultaneously with substrate production. It can prevent malfunctioning from that of light being irradiated by the loaded IC chip by coloring only portions other than a viewing area.

[0043]The half of the viewing area of a substrate can also be colored a different color. This should just apply resin board processing technology (injection processing, complexion processing, etc.). The half of a viewing area can also be made into different EL layer thickness from that of using the same processing technology. An indicator and a circuit part can also be formed simultaneously. It is also easy to change the substrate thickness of a viewing area and a driver loading field.

[0044]A micro lens can also be formed in the substrate 41 or the substrate 49 so that it may correspond to a pixel, or so that it may correspond to a viewing area. A diffraction grating may be formed by processing the substrates 41 and 49. Unevenness more detailed enough than pixel size is formed, an angle of visibility can be improved or view angle dependence can be given. Processing of such arbitrary shape, ultra-fine processing technology, etc. are realizable with the La Stampa art which OMRON Corp. developed and which carries out micro-lens formation.

[0045]As for the substrates 41 and 49, the stripe like electrode (not shown) is formed. An antireflection film (AIR coat) is formed in the field where a substrate touches air. When the polarizing plate etc. are not stuck on the substrates 41 and 49, an antireflection film (AIR coat) is directly formed in the substrates 41 and 49. When other components, such as a polarizing plate (polarization film), are stuck, an antireflection film (AIR coat) is formed in the surface of the component, etc.

[0046]Although it explained as a center that the substrates 41 and 49 formed the above example with a plastic, it does not limit to this. For example, even if the substrates 41 and 49 are a glass substrate and a metal substrate, press working of sheet metal, cutting, etc. can form or constitute the uneven part 252, the heights 252, etc. The coloring to a substrate, etc. are possible. Therefore, the explained matter is not limited to a plastic plate. It does not limit to a substrate, either. For example, a film or a sheet may be sufficient.

[0047]In order to prevent or control adhesion of the garbage to the surface of a polarizing plate, it is effective to form the thin film which consists of fluoro-resins. Conductor films which have a hydrophilic group for electrostatic prevention, such as a thin film, a conductive polymer film, and a metal membrane, may be applied or vapor-deposited.

[0048]The polarizing plate (polarization film) arranged or formed in the light incidence face or light emitting surface of the display panel 82 may not be limited to what is made into linear polarization, and may serve as elliptical polarization. Two or more polarizing plates may be stretched, a polarizing plate and a phase difference plate may be combined, or what was stretched may be used.

[0049]As a main material which constitutes a polarization film, a TAC film (triacetyl cellulose film) is the optimal. A TAC film is because it has the outstanding optical property, surface smoothness, and processing suitability.

[0050]The composition which forms an AIR coat with dielectric monolayer or a multilayer film is illustrated. In addition, resin of the low refractive index of 1.35-1.45 may be applied. For example, the acrylic resin of a fluorine system, etc. are illustrated. Especially the characteristic has [a refractive index] good or more 1.37 1.42 or less thing.

[0051]An AIR coat has the composition of three layers, or two-layer composition. In the case of three layers, it is used in order to prevent reflection in the wavelength band region of large visible light. This is called a multi-coat. In a two-layer case, it is used in order to prevent reflection in the wavelength band region of specific visible light. This is called V coat. A multi-coat and V coat are properly used according to the use of a display panel. Not the thing to limit more than two-layer but one layer may be sufficient.

[0052]In the case of a multi-coat, optical thickness laminates $nd_1 = \lambda/2$, and magnesium fluoride (MgF_2) $nd_1 = \lambda/4$, and forms an aluminum oxide (aluminum $2O_3$) for $nd = \lambda/4$, and a zirconium (ZrO_2). Usually, a thin film is formed as a value of 520 nm or the neighborhood of those as λ .

[0053]In the case of V coat, $nd_1 = \lambda/4$ or yttrium oxide (Y_2O_3), and magnesium fluoride (MgF_2) are laminated $nd_1 = \lambda/4$, and it forms silicon monoxide (SiO) for optical thickness $nd_1 = \lambda/4$, and magnesium fluoride (MgF_2). It is better to use Y_2O_3 , when modulating blue glow, since SiO has an absorption band region in the blue side. Since the direction of Y_2O_3 is stable also from the stability of a substance, it is desirable. SiO₂ thin film may be used. Of course, it is good also as an AIR coat using resin of a low refractive index, etc. For example, acrylic resins, such as fluoride, are illustrated. As for these, it is preferred to use an ultraviolet curing type.

[0054]In order to prevent static electricity from being charged by the display panel, it is preferred that hydrophilic nature consists of good materials in substrate materials, such as to apply resin of hydrophilic nature to the surfaces, such as light guide plates, such as a cover substrate, and the display panel 82, or a panel.

[0055]The thin film transistor (TFT) as two or more switching elements or current control elements is formed in 1 pixel. TFT to form may be the same kind of TFT, and like TFT of P channel type and N channel type, although it may be TFT of a different kind, a switching transistor and the transistor for a drive of the thing of like-pole nature are desirably desirable. The structure of TFT is not limited by planer type TFT, and may also depend that in which a stagger type or a reverse stagger type may be used, and the impurity range (source, drain) was formed using the self aryne method on a non-self aryne method.

[0056]The EL display device 15 of this invention has EL structure by which ITO and one or more sorts of organic layers which serve as a hole injection electrode (picture element electrode) on a substrate, and an electron injection electrode were laminated one by one. TFT is provided in said substrate.

[0057]In order to manufacture EL display device of this invention, the array of TFT is first formed on a substrate at desired shape. And ITO which is a transparent electrode as a picture element electrode on a flattening film is formed and patterned by a sputtering technique. Then, an organic electroluminescence layer, an electron injection electrode, etc. are laminated.

[0058]What is necessary is just to use the usual polycrystalline silicon TFT as TFT. TFT is provided in the end of each pixel of EL structure, and the size is about 10-30 micrometers. The sizes of a pixel are 20 micrometers x 20 micrometers - 300 micrometers x about 300 micrometers.

[0059]The wiring electrode of TFT is provided on a substrate. Although there is a function for the resistance of a wiring electrode to be low, it to electrically connect a hole injection electrode, and to hold down resistance low and that in which the wiring electrode contains any one sort of aluminum, aluminum and a transition metal (however, except for Ti), Ti, or the titanium nitride (TiN) or two sorts or more is generally used. In this invention, it is not restricted to this material. What is necessary is just to be usually about 100-1000 nm as thickness of the whole which combined the hole injection electrode used as the ground of EL structure, and the wiring electrode of TFT, although there is no restriction in particular.

[0060]An insulating layer is provided between the wiring electrode of TFT11, and the organic layer of EL structure. That in which the insulating layer formed inorganic system materials, such as silicon oxide of SiO₂ grade, and silicon nitride, with weld slag or vacuum deposition, As long as the coat etc. of resin system materials, such as a silicon oxide layer formed by SOG (spin one glass), photoresist, polyimide, and an acrylic resin, have insulation, they may be any. Polyimide is especially preferred. An insulating layer also plays the role of the anticorrosion and the waterproof film which protects a wiring electrode from moisture or corrosion.

[0061]The light emission peak of EL structure may be two or more. As for EL display device of this invention, green and a blue light part are obtained with the combination of EL structure of blue-green luminescence, and a green transmission layer or a blue transmission layer, for example. A red light part can be obtained by the fluorescence conversion layer which changes bluish green luminescence of EL structure of blue-green luminescence, and this EL structure into the wavelength near red.

[0062]Next, EL structure which constitutes the EL display device 15 of this invention is explained. EL structure of this invention is provided with the following.

The electron injection electrode which is a transparent electrode.

One or more sorts of organic layers.

Hole injection electrode.

An organic layer has a hole transporting bed of at least one layer, and a luminous layer, respectively, for example, has an electron injection transporting bed, a luminous layer, an electron hole transporting bed, and a hole injection layer one by one. There may not be any hole transporting bed. The organic layer of EL structure of this invention can be considered as various composition, it may omit electron injection and a transporting bed, may make it a luminous layer and one, or may mix a hole-injection transporting bed and a luminous layer. An electron injection electrode comprises the small metal, compound, or alloys of the work function preferably formed with vacuum deposition, such as vacuum evaporation and a sputtering technique.

[0063]Since it is the structure which takes out the light which emitted light from the hole injection electrode side as a hole injection electrode, ITO (tin dope indium oxide), IZO (zinc dope indium oxide), ZnO, SnO₂, and In₂O₃ grade is mentioned, for example, but especially ITO/IZO is preferred. The thickness of a hole injection electrode should just have the thickness more than [which can perform hole pouring enough] fixed, and it is usually preferred to be referred to as about 10-500 nm. In order to raise the reliability of an element, it is required for driver voltage to be low, but ITO of 10-30ohms / ** (50-300 nm of thickness) is mentioned as a desirable thing. When actually using it, the cross protection by reflection by hole injection electrode interfaces, such as ITO, should just set up the thickness and the optical constant of an electrode fully satisfy optical extraction efficiency and color purity.

[0064]Although a hole injection electrode can be formed with vacuum deposition etc., forming by a sputtering technique is preferred. It does not restrict and what is necessary is just to use inactive gas, such as Ar, helium, Ne, Kr, and Xe, or these mixed gas especially as sputtering gas.

[0065]An electron injection electrode comprises the small metal, compound, or alloys of the work function preferably formed with vacuum deposition, such as vacuum evaporation and a sputtering technique. In order to raise metallic element simple substances, such as K, Li, Na, Mg, La, Ce, Ca, Sr, Ba, aluminum, Ag, In, Sn, Zn, and Zr, or stability as a component of the electron injection electrode formed, it is preferred to use the alloy system of two ingredients and three ingredients containing them. As an alloy system, Ag-Mg (Ag:1 - 20at%), aluminum-Li (Li:0.3 - 14at%), In-Mg (Mg:50 - 80at%), aluminum-Ca (Ca:5 - 20at%), etc. are preferred, for example.

[0066]The thickness of an electron injection electrode thin film should just make electron injection the thickness more than [which can be performed enough] fixed, and should just set it to 1 nm or more preferably 0.1 nm or more. Although there is no restriction in particular in the upper limit, the thickness is just usually about 100-500 nm.

[0067]A hole injection layer has a function which makes easy pouring of the electron hole from a hole injection electrode, and an electron hole transporting bed has a function which bars the function and electron which convey an electron hole, and is also called an electric charge pouring layer and a charge transport layer.

[0068]An electron injection transporting bed is provided when the electron injection transportation function of the compound used for a luminous layer is not so high, and it has a function which bars the function which makes easy pouring of the electron from an electron injection electrode, the function to convey an electron, and an electron hole. A hole injection layer, an electron hole transporting bed, and an electron injection transporting bed increase - Make the electron hole and electron which are

poured in to a luminous layer shut up, make a recombination area optimize, and improve luminous efficiency. An electron injection transporting bed may be separately provided in a layer with a pouring function, and a layer with a transportation function.

[0069]Although the thickness of a luminous layer, the thickness which combined the hole injection layer and the electron hole transporting bed, and the thickness in particular of an electron injection transporting bed are not limited but it changes also with formation methods, it is usually preferred to be referred to as about 5-100 nm.

[0070]What is necessary is just to make them into comparable as the thickness of a luminous layer or 1 / about 10 to 10 times, although the thickness of a hole injection layer and an electron hole transporting bed and the thickness of an electron injection transporting bed are based on the design of a recombination-radiation field. As for the thickness of a hole injection layer and an electron hole transporting bed, and each thickness in the case of dividing an electronic injection layer and an electron transport layer, it is [a pouring layer / 1 nm or more and a transporting bed] preferred to be referred to as not less than 20 nm. The maximum of the thickness of the pouring layer at this time and a transporting bed is [in a pouring layer] usually about 100 nm at about 100 nm and a transporting bed. It is also the same as when providing two layers of pouring transporting beds about such thickness.

[0071]By what thickness is controlled for taking into consideration the carrier mobility and carrier density (decided by ionization potential and electron affinity) of the luminous layer and electron injection transporting bed to combine, or a hole-injection transporting bed. It is possible to design a recombination area and a luminous region freely, and design of the luminescent color, control of the light emitting luminance and the emission spectrum by the cross protection of two electrodes, and control of the spatial distribution of luminescence are enabled.

[0072]The luminous layer of EL element 15 of this invention is made to contain the fluorescence substance which is a compound which has a luminescence function. Tris(8-quinolinolato) aluminum which is indicated by JP,63-264692,A etc. as this fluorescence substance, for example [Alq3] A blue-green luminescent material which is indicated by the metal complex coloring matter of **, JP,6-110569,A (phenyl anthracene derivative), a 6-114456 gazette (tetra aryl ethene derivative), JP,6-100857,A, the JP,2-247278,A, etc. is mentioned.

[0073]The organic EL device 15 of blue light is good to use for the material of a luminous layer "DMPen (Triphenylamine)" whose luminous wavelength is about 400 nm. Under the present circumstances, it is preferred that a band gap adopts the same material as a luminous layer as an electronic injection layer (Bathocuproine) and a hole injection layer (m-MTDATXA) in order to raise luminous efficiency. Only by a band gap using 3.4 eV and large DMPen for a luminous layer, it is because an electron remains in an electronic injection layer, an electron hole remains in a hole injection layer and the recombination of an electron and an electron hole does not happen easily due to a luminous layer. The luminescent material provided with an amine group like DMPen is solvable by moving the energy excited in DMPen to a dopant to the technical problem that structure is unstable and it is hard to extend the life-span of [it], and making light emit from a dopant.

[0074]As an EL material, luminous efficiency can be improved by using a phosphorescence luminescent material. The external quantum efficiency of firefly luminescence material is about 2 to 3%. Since a phosphorescence luminescent material reaches to about 100% to the firefly luminescence material being 25% in internal quantum efficiency (efficiency which changes the energy by excitation to light), external quantum efficiency becomes high.

[0075]It is good for the host material of the luminous layer of an organic EL device to use CBP. The phosphorescence luminescent material of red (R) or green (G) blue (B) is doped here. All the doped materials contain Ir. R material is good for Btp2Ir (acac) and G material to use 2(ppp)Ir (acac), and for B material to use Flrpic.

[0076]To a hole injection layer and an electron hole transporting bed, for example JP,63-295695,A, JP,2-191694,A, JP,3-792,A, JP,5-234681,A, The various organic compounds indicated in JP,5-239455,A, JP,5-299174,A, JP,7-126225,A, JP,7-126226,A, JP,8-100172,A, and EP0650955A1 grade can be used. It is preferred to use a vacuum deposition method for formation of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, since a homogeneous thin film can be formed.

[0077]Hereafter, it explains in more detail about the manufacturing method and structure of an EL display panel of this invention. As explained above, TFT11 which drives a pixel to the array substrate 49 is formed first. One pixel comprises four pieces or five TFT(s). Current programming of the pixel is carried out and the programmed current is supplied to EL element 15. Usually, the value by which current programming was carried out is held as a pressure value at the storage capacitance 19. Pixel configurations, such as combination of this TFT11, are explained later. Next, the picture element electrode as a hole injection electrode is formed in TFT11. The picture element electrode 48 is patternized by photo lithography. In order to prevent the image quality deterioration by a phot conductor phenomena (it is henceforth called contest a phot) generated by carrying out light incidence to the lower layer of TFT11, or the upper layer TFT11, a light-shielding film is formed or arranged.

[0078]current programming impresses program current to a pixel from the source driver circuit 14 (or -- absorbing from a pixel to the source driver circuit 14), and makes the signal value equivalent to this current hold to a pixel The current corresponding to this held signal value is sent through EL element 15 (or it slashes from EL element 15). That is, the current which is programmed with current and carries out considerable (correspondence) to the programmed current is sent through EL element 15.

[0079]On the other hand, a voltage program impresses program voltages to a pixel from the source driver circuit 14, and makes the signal value equivalent to this voltage hold to a pixel. The current corresponding to this held voltage is sent through EL element 15. That is, it programs on voltage, and voltage is transformed into a current value within a pixel, and the current which carries out considerable (correspondence) to the programmed voltage is sent through EL element 15.

[0080]What is necessary is to use the pentacene molecule which consists of carbon and hydrogen, and just to form an electronic thin film by processing the surface which forms an organic semiconductor, in order to form TFT in a plastic plate. This thin film possesses sufficient semiconductor characteristic suitable for electron device manufacture while having one 100 times [20 to] the size of the conventional crystal grain of this.

[0081]When pentacene grows on a silicon substrate, it has the tendency to adhere to a surface impurity. For this reason, growing up becomes irregular and it becomes a crystal grain which is too small for manufacturing a quality device. In order to grow up a crystal grain more greatly, it is good to apply first the monolayer "molecule buffer" of the molecule called a

cyclohexene on a silicon substrate. In "sticky sites (place which adheres easily)" on silicon, for a wrap reason, this layer can do the clean surface, and it grows up to be even a crystal grain in which pentacene is very big.

[0082]By using the thin film of these big new crystal grains, the flexible transistor (TFT) using pentacene of the large-sized crystal grain is producible. A transistor (TFT) can be manufactured by applying a liquefied material at a temperature low for mass production of such a flexible transistor.

[0083]It may heat and semiconductor membrane may be formed, after forming in the metal thin film and island shape which serve as a gate on a substrate and vapor-depositing or applying an amorphous silicon film on this. Semiconductor membrane crystallizes good into the portion formed in island shape. Therefore, mobility becomes good.

[0084]It is preferred to adopt the structure called a static induction transistor (SIT) as an organic transistor (TFT). Pentacene of an amorphous state is used. The mobility of an electron hole is lower than $1 \times 10^{-4} \text{ cm}^2/\text{Vs}$ and the crystallized pentacene. However, a frequency characteristic can be improved by adopting SIT structure. The thickness of pentacene has preferred or more 100 nm set to 300 nm.

[0085]A p type field effect transistor may be sufficient as organic TFT. TFT can be formed on a plastic plate. As for the pentacene which can constitute a flexible TFT type display panel, since it is possible to bend the whole plastic plate, it is preferred to consider it as a polycrystalline state. It is preferred to use PMMA for the material of gate dielectric film. A naphthalene may be used for the active layer of an organic transistor.

[0086]If oxygen plasma and O_2 Usher are used at the time of washing, ashing also of the flattening film 71 of the periphery of the picture element electrode 48 will be carried out simultaneously, and the periphery of the picture element electrode 48 will be scooped out. In order to solve this technical problem, in this invention, the edge protective film 81 which consists picture element electrode 48 periphery of acrylic resins as drawing 8 shows is formed. As a component of the edge protective film 81, the organic materials and the identical materials which constitute the flattening film 71, such as acrylic resin and polyimide resin, are illustrated, in addition inorganic materials, such as SiO_2 and SiN_x , are illustrated. In addition, it cannot be overemphasized that it may be aluminum 2O_3 etc.

[0087]The edge protective film 81 is formed so that after the patterning 48 of the picture element electrode 48 and between the picture element electrode 48 may be filled. Of course, it cannot be overemphasized that it is good also as the bank 3661 (spacer keep a metal mask from touching the picture element electrode 48 directly) of the metal mask at the time of forming this edge protective film 81 in or more 2 a height of 4 micrometers or less, and distinguishing organic electroluminescence material by different color with.

[0088]It is effective also in enlarging the picture element electrode 48 so that it may illustrate to Drawing 366 improving luminous efficiency. Drawing 366 forms the bank 3661 which makes an edge protective film serve a double purpose around the picture element electrode 48. The bank 3661 is formed in or more 2 a height of 4 micrometers or less. The bank 3661 functions as a spacer kept from touching the metal mask (not shown) picture element electrode 48 at the time of distinguishing organic electroluminescence material by different color with directly.

[0089]In this invention illustrated to Drawing 366, it puts on the picture element electrode 48, and the 2nd picture element electrode 3662 is formed in the bank 3661 in piles. In the 2nd picture element electrode 3662, it is formed with the picture element electrode 48 and an identical material. Of course, material may be changed. As for the 2nd picture element electrode, the picture element electrode 48 and an electrical link are taken. It is formed in the bank 3661 in piles. Therefore, a pixel numerical aperture becomes high.

[0090]EL film (47R (red), 47G (green), 47B (blue)) is formed on this 2nd picture element electrode 3662. Each EL film opens few crevices, and is formed, or piles up a periphery. The piled-up part hardly emits light. The aluminum film used as a cathode is formed on the EL film 47. In Drawing 366, the 2nd electrode is used as a reflector and, originally it is good also considering the reflection film 46 as a transparent electrode. That is, it is upper extraction of light.

[0091]In the composition of Drawing 366, the slant face of the bank 3661 is used as a pixel opening. Therefore, since the current density impressed to EL film can be fallen and an emission area becomes large, efficiency becomes good (a pixel numerical aperture improves substantially).

[0092]The method which raises hereafter the extraction efficiency of the light generated within other EL display panels is explained. Drawing 279 illustrates the technical problem of the conventional EL display. In Drawing 279, 2791 is illustrating the locus of light.

[0093]It reflects with the cathode 46 and the light generated by the EL film 47 is emitted from the substrate 49 with which the driver circuit 12 (14) was formed. This light 2791a emits the light which entered at an angle of predetermined from the substrate 49 to the interface of the substrate 49 and air. However, total internal reflection of the light 2791b which entered the angle beyond the critical angle θ_c will be carried out within the substrate 49. Scattered reflection of this light 2791b that carried out total internal reflection is carried out within the substrate 49, and it reduces display contrast.

[0094]The light 2791b which carried out total internal reflection is lost. The rate of the light used as this loss amounts to two thirds of the amounts of total luminous flux which EL element 15 generates. Therefore, reducing generating of the light 2791b links with improvement in the rate for Mitsutoshi directly.

[0095]The composition which solves this technical problem is the composition of Drawing 280. The refraction sheet (an optical refracting member or a light refracting plate) is attached on the sealing film 73 explained by drawing 7 etc. (it arranged or forms). The refraction part 2801 is formed on the triangle, the polygon, or the circle so that the refraction sheet 2801 may correspond to the pixel 16. This refraction part 2801 may form a reflection film in the portion (inner surface of the refraction part 2802) which the whole may constitute from a transparent member and is shown by a of Drawing 280. The interference film constituted by forming the dielectric film of a low refractive index besides metal membranes, such as aluminum and silver, and the dielectric film of a high refractive index in a multilayer may be sufficient as a reflection film. Shape may be set up become a total reflection area by a Snell's law.

[0096]The flection 2802 may be directly formed not only in the composition which attaches what formed the flection 2802 in the refraction sheet on the sealing film 73 but in the sealing film 73. In lower extraction of light, substrate 49 self may be processed, and it may form the flection 2802. It may form or arrange on a sealing plate.

[0097]It may not limit circularly and a polygon and the shape of a screen may have [the shape of a slant face, or] as the shape

of the flection 2802. Many needlelike projections crowded and could be formed. The flection 2802 is based on being formed in the periphery of the light-emitting part of the pixel 16. That is, if the numerical aperture of the pixel 16 is 30%, it will form in the nonluminescent part (getting it blocked 70% of portion) of the pixel 16. Of course, it cannot be overemphasized that the formation position of the flection 2802 may lap with a light-emitting position.

[0098]Although the flection 2802 is based on being formed in the periphery of the light-emitting part of the pixel 16, it is preferred to change the center section of the viewing area 21 somewhat by a periphery. In the center section of the viewing area 21, the flection 2802 is formed so that it may be arranged exactly at the periphery of the light-emitting part of the pixel 16. In the periphery of the viewing area 21, the flection 2802 was shifted outside from the center position of the light-emitting part of the pixel 16 -- it forms so that it may arrange (formation). Thus, by changing the formation position of the flection 2802 by the center section and periphery of a viewing area, generating of moire can be controlled and generating of color unevenness can be controlled.

[0099]Also by forming the position of the flection 2802 somewhat at random for every pixel, generating of moire can be controlled and generating of color unevenness can be controlled.

[0100]It may constitute so that the light which emitted light by EL element 15 may pass the inside of the flection 2802, and it may be refracted by this flection 2802 and it may be emitted to the front face of a panel. That is, the flection 2802 acts as prism. In this case, the flection 2802 needs to consist of light transmission material.

[0101]When the flection 2802 forms with light transmission material, it is effective to color this material. It is because the effect of the light filter which omits the zone of the light emitted from EL element 15 can be demonstrated. Therefore, the color purity of an EL display panel improves and it becomes good [a white balance]. When EL element 15 is white light, a light filter cannot be provided but this flection 2802 can be utilized as a light filter. Of course, it cannot be overemphasized that the flection 2802 which formed the light filter separately and was colored further may be formed or arranged. The flection 2802 or the refraction sheet 2801 may be colored directly. The flection 2802 or the refraction sheet 2801 may be formed by coloring material.

[0102]As a coloring matter, what distributed coloring matter or paints in resin may be used, and gelatin and casein may be dyed by acid dye like a light filter. Fluoran system coloring matter can be made to be able to color and can also be used. What is necessary is just to use not the thing that needs three colors of RGB but one or more arbitrary colors. A natural resin can be dyed using coloring matter. The material which distributed coloring matter in the synthetic resin can be used. Two or more kinds of combination may be sufficient as the range of selection of coloring matter in [those] one suitable sort from azo dye, anthraquinone dye, phthalocyanine dye, a triphenylmethane color, etc.

[0103]As for the component of the flection 2802 and the refraction sheet 2801, it is preferred to use polymer (2861). As polymer (2861), photo-curing type resin is used from points, such as an ease of a manufacturing process, and separation with a liquid crystal phase. The acrylic monomer which ultraviolet curing nature acrylic resin is illustrated as a concrete example, and carries out polymerization curing especially by UV irradiation, and the thing containing acrylic oligomer are preferred. The photoresist acrylic resin which has a fluorine group especially has little aging, and its lightfastness is also good.

[0104]As a polymers formation monomer which constitutes polymer (2861), 2-ethylhexyl acrylate, 2-hydroxyethyl acrylate, Neopentyl glycol door KURIRETO, a hexandiol JIAKU lied, They are diethylene glycol diacrylate, tripropylene glycol diacrylate, polyethylene-glycol diacrylate, trimethylolpropane triacrylate, pentaerythritol acrylate, etc.

[0105]As oligomer or a prepolymer, polyester acrylates, epoxy acrylate, polyurethane acrylate, etc. are mentioned.

[0106]May use a polymerization initiator, in order to polymerize promptly, and as this example, 2-hydroxy-2-methyl-1-phenylpropan-1-one ("DAROKYUA 1173" by Merck Co.), 1-(4-isopropylphenyl)-2-hydroxy-isobutane 1-one ("DAROKYUA 1116" by Merck Co.), 1-BIDOROKISHI cyclohexylphenyl ketone ("IRGACURE 184" by a tiba guy key company), benzyl methyl ketal ("IRGACURE 651" by Ciba-Geigy), etc. are hung up. In addition, a chain transfer agent, a photosensitizer, a color, a cross linking agent, etc. can be suitably used together as an optional component.

[0107]The matter about the above polymer (2861) is applied mainly with the manufacturing method of Drawing 286, Drawing 287, and Drawing 290. In the case of the manufacturing method of Drawing 288, the flection 2802 is formed with an inorganic material. Of course, it may be a case of Drawing 288 or may form with organic materials like polymer.

[0108]Arrangement of the flection 2802 is good to use the shape of a hexagon so that it may illustrate to Drawing 281. Of course, more than an octagon etc. may be sufficient. The flection 2802 is formed in the circumference of the light-emitting part of the pixel 16. Even when an EL display panel is observed by considering it as hexagon shape as mentioned above, and changing the viewpoint which sees a display screen, generating of color unevenness and a color shift can lessen dramatically. There are also little light-emitting position of the pixel 16 and generating of the moire by position gap of the flection 2802.

[0109]Drawing 281 showed the example of composition (vertical stripe composition) of having arranged the same color to the sliding direction of Screen 21. By forming the color arrangement of a pixel in mosaic shape, as shown in Drawing 282 (arrangement), even if it is when there are comparatively few dot numbers which constitute a display panel, the resolution of the oblique direction of a picture improves.

[0110]Two or more flections 2802 may be formed or arranged to the one pixel 16 so that it may illustrate to Drawing 283. In the example of Drawing 283, the pixel 16 has one picture element electrode, and the three flections 2801 (2801a, 2801b, 2801c) are formed to this one picture element electrode (arrangement). Of course, it has two or more picture element electrodes in the one pixel 16, and the flection 2801 may form to each picture element electrode, respectively (arrangement). Even if it divides a picture element electrode into plurality to one picture element electrode, the decline in a numerical aperture is seldom produced. It is because TFT for a drive or switching, etc. are arranged to the periphery of a picture element electrode.

[0111]Of course, the one flection 2802 may be arranged to the one pixel 284 so that it may illustrate to Drawing 284 (formation). it illustrates to Drawing 285 (a) -- as -- one pixel -- two rows -- and the flection 2802 of plurality (Drawing 285 (a) 2x6 pieces) may be formed. As shown in Drawing 285 (b), two or more (Drawing 285 (b) three pieces) flections 2802 of polygonal shape, such as a hexagon, may be formed at one picture element electrode.

[0112]Hereafter, the manufacturing method which forms the flection 2802 (the refraction sheet 2801 may be included) is explained.

[0113]Drawing 286 shows the 1st example of this invention. First, the EL film 47 is formed in the substrate 49 with which 11 pixel TFT16, the driver circuits 12 and 14, etc. were formed. Formation may form a low molecule EL film by vacuum evaporation,

and may form a polymers EL film with an inkjet method. An electrode is formed on the EL film 47 and the sealing film 73 is formed on this (Drawing 286 (a)). A sealing plate may be attached. About these matters, since other parts explain in detail, it omits here.

[0114]The manufacturing method indicated on the specifications of this invention is applied except the matter explained below. It cannot be overemphasized that it is applied to the following manufacturing methods or panels which were manufactured etc. also about the composition of EL element 15, a pixel configuration, array constitution, panel structure, a drive method, a drive circuit, etc. It cannot be overemphasized that an information display device, television, a monitor, a camera, etc. can be constituted using the panel etc. which were manufactured with the following manufacturing methods, either.

[0115]Next, as shown in Drawing 286 (b), an unhardened BORIMA material (transparent membrane 2861) is applied on the sealing film 73. As the polymeric material 2861, it is the material of the refraction part 2802 explained previously. Spreading may use which methods (PRIOR ART), such as offset printing, screen-stencil, spreading with a roller, and spreading with a spinner.

[0116]Predrying is put in and carried out to oven after spreading of the unhardened polymeric material 2861. Or the polymer 2861 is irradiated with a taper (ultraviolet rays (UV) and visible light may be sufficient), and the mobility of the polymeric material 2861 is stopped. Then, it pushes against the transparent membrane 2861, rotating the roller 2862 in which the shape of the refraction part 2802 was formed. Thus, the uneven shape of the roller 2862 is transferred to the transparent membrane 2861. The unevenness (crevice) 2863 which is equivalent to the transparent membrane 2862 at the refraction part 2801 makes it form by this transfer. The transparent membrane 2861 whole is irradiated with UV or visible light after formation of the uneven part 2863, and the transparent membrane 2861 is stiffened thoroughly.

[0117]Temperature control is important when polymerizing the transparent membrane 2861. Warming is carried out just over or below 60 degrees 40 degrees or more. Although ultraviolet rays (UV) are based also on spectral distribution, they carry out a for [8 seconds] grade exposure from 2 seconds by about two 20 to 30 mW/cm intensity. Such temperature and the exposure conditions of ultraviolet rays must be defined in consideration of add-in material of the transparent membrane 2861, etc. The surface becomes cloudy when conditions are unsuitable. It becomes detailed rugged form. In this invention, the ultrahigh pressure mercury lamp was used for the light source at the temperature of 50 **, the transparent membrane 2861 was irradiated with ultraviolet rays (irradiation intensity in a substrates face: 30mW/cm²) for 6 seconds, and the transparent membrane 2861 was stiffened.

[0118]The light source of ultraviolet rays (UV2902) may be arranged inside the roller 2862, the transparent membrane 2861 may be irradiated with UV in accordance with advance of the roller 2862, and it may be made to harden one by one. The source of release of UV2902 is separately established with the roller 2862, and the transparent membrane 2861 may be irradiated with UV and it may be made to harden one by one from this source of release in accordance with advance of the roller 2862. A reflection film etc. are formed in the required portion of the flection 2802. About the composition of a reflection film, since Drawing 280 explained, it omits.

[0119]The refraction part 2802 may be formed with the manufacturing method of Drawing 290. Since Drawing 290 (a) and (b) is the same as Drawing 286 (a) and (b), explanation is omitted. In Drawing 290 (c), La Stampa 2901 (press board) which consists of transparent materials is used. Unevenness of the refraction part 2802 and opposite shape is formed in the press board 2901. The press board 2901 is formed from transparent materials, such as silica glass. Unevenness of the press board 2901 is transferred by the transparent membrane 2861 by pushing this press board 2901 against the transparent membrane 2861.

[0120]Thus, the uneven shape of the press board 2901 is transferred to the transparent membrane 2861. The unevenness (crevice) 2863 which is equivalent to the transparent membrane 2862 at the refraction part 2801 makes it form by this transfer. The transparent membrane 2861 whole is irradiated with UV or the visible light 2902 via the press board 2901, and is made to harden the transparent membrane 2861 thoroughly after formation of the uneven part 2863.

[0121]It is preferred to form in the rugged surface of the press board 2901 the good film of the mold releasability which consists of material of the Ole Von system, etc. By forming the good thin film of such mold releasability in the rugged surface, the mold releasability of the transparent membrane 2861 and the press board 2901 becomes good, and manufacturing efficiency improves. Temperature controlling is also important for the press board 2901 and the transparent material 2861. As for the press board 2901, it is more preferred than the transparent membrane 2861 to make temperature low about 15 degrees from 5 times. As for mold releasability, the direction made the relation with a reverse temperature depending on the kind of transparent membrane 2861 may become good. Therefore, it is necessary to fully experiment and to define conditions.

[0122]As a ** form film, olefin system resin films, such as a silicon resin film, a fluoro resin film, polyethylene, and polypropylene, are illustrated, and what applied silicon resin and a fluoro-resin on the surface of the resin film is illustrated. If others penetrate ultraviolet rays and have a certain amount of pliability, they are [anything] good. For example, a glass substrate etc. can be used.

[0123]After removing the press board 2901 so that it may illustrate by 290 (d), the transparent membrane 2861 whole is irradiated with UV (visible light), and an unhardened resinous principle is stiffened thoroughly. Also in a heat-curing type case, this has the same transparent membrane 2861.

[0124]Although the transparent membrane 2861 presupposed that an ultraviolet curing type is used in the manufacturing method explained with Drawing 286, Drawing 290, etc., this invention is not limited to this. For example, it cannot be overemphasized that a thermoplastic type resin material, a heat-curing type resin material, resin materials, such as a room-temperature-setting type etc. of 2 liquid type which it begins to harden by mixing 2 liquid, etc. can be used. In the above case, the polymer 2861 does not need to be a transparent material. The selection range of the polymeric material 2861 also spreads and epoxy system resin, phenol system resin, etc. can be used. In this case, after forming the unevenness 2863, heating, neglect, etc. are carried out and the flection 2802 is formed. Of course, the press board 2901 may be stiffened in the state where it pushed against the transparent membrane 2861. A reflection film etc. are formed in the required portion of the flection 2802. About the composition of a reflection film, since Drawing 280 explained, it omits.

[0125]Drawing 287 shows other examples of this invention. Since Drawing 287 (a) is the same as that of other examples, explanation is omitted.

[0126]In Drawing 287 (b), the heights 2871 are formed on the sealing film 73. It is made in agreement [the formation position of the heights 2871] with flection 2802 formation position. That is, it is a periphery of a pixel periphery or the light-emitting part of

a pixel. In a liquid crystal display panel, it is a formation position of a black matrix (BM). The heights 2871 are formed using inorganic materials, such as SiO₂ and SiN_x. Organic materials may be used like the transparent membrane 2861. As a formation method of the heights 2871, an inorganic thin film or an organic thin film is vapor-deposited or applied by a thickness of 0.5–3 micrometers on the sealing film 73 or a sealing plate. A mask is formed on it and it etches with a negative or a positive using said mask (Drawing 287 (b)).

[0127]Next, the transparent membrane 2861 is applied to the whole viewing area 21 so that it may illustrate to Drawing 287 (c). Spreading may use which methods (PRIOR ART), such as offset printing, screen-stencil, spreading with a roller, and spreading with a spinner.

[0128]As for the resin to apply, it is preferred to set viscosity to 40 or less cp of 5 or more cp. That is, that which fell viscosity comparatively is used. The transparent membrane 2861 is smoothly formed along with the heights 2871. As mentioned above, in Drawing 287, the flection 2802 is formed by the heights 287 and the transparent membrane 2861. A reflection film etc. are formed in the required portion of the flection 2802. About the composition of a reflection film, since Drawing 280 explained, it omits.

[0129]In Drawing 287 (c), although a transparent membrane is applied to the whole viewing area 21, it may not limit to this, and the thin film which consists of inorganic materials may be vapor-deposited. The flection 2802 is formed by unevenness of the heights 2871 by vapor-depositing an inorganic material.

[0130]Drawing 288 shows other examples of this invention. Since Drawing 288 (a) is the same as that of other examples, explanation is omitted. In Drawing 288 (b), the metal mask 2881 is arranged on the sealing film 73 or a closure lid. As for the opening of the metal mask 2881, the sealing film 73 side has a large opening, and, on the other hand, the side is narrow.

[0131]The metal mask 2881 is produced with a magnetic body, and adsorbs the metal mask 2881 magnetically with a magnet from the rear face of the substrate 49. By magnetism, the metal mask 2881 is stuck without a substrate and a crevice.

[0132]In order to carry out the metal mask 2881 explained with Drawing 288 as [touch / the sealing film 73 / directly] (or contacting the sealing film 73 as much as possible, and twisting like), it forms a 1.5–3-micrometer-high projection in the rear face of the metal mask 2881. Or a 1.5–3-micrometer-high projection is formed in the surface of the sealing film 73 or a closure lid. This projection is formed in the part which does not vapor-deposit the EL film 47. For example, it is between the pixels which adjoined.

[0133]Inorganic materials, such as SiO₂ and SiN_x, are made to deposit via the metal mask 2881, as illustrated in Drawing 288 (b). A deposition part is a formation point of the flection 2802. Organic materials may be used like the transparent membrane 2861 instead of an inorganic material. The flection 2802 can be formed using the metal mask 2881 as mentioned above.

[0134]Drawing 280 showed the flections (or light reflection section) 2802, such as the shape of prism. However, this invention is not limited to this. For example, corresponding to the pixel 16, the micro-lens-like flection 2802 may be formed so that it may illustrate to Drawing 289. As for a micro lens, it is preferred to use the shape of a sine curve. Although forming circularly is preferred, it may not limit to this and may be boiled fish paste-like. The height of a micro lens has preferred not less than 15-micrometer thing set to 3100 micrometers or less.

[0135]vapor-depositing Ti to the soda glass substrate which becomes a basis of a microlens substrate — photograph phosphorus — it is gruffy and the circular window corresponding to a pixel is opened. Next, it dips in the melting liquid of the nitrate of univalent ion, and heat-treats at 400 degrees or more. At the time of heating, the positive ion under melting carries out isotropic diffusion into a glass substrate from an opening window, and ionic exchange is performed. If ionic exchange is carried out, the portion will produce refractive index distribution. Refractive indices are 1.5–1.7. A micro lens is produced as mentioned above.

[0136]A micro lens is formed with the La Stampa art. This La Stampa art applies the method which OMRON Corp. has adopted as the method of micro-lens formation, the method which Matsushita Electric uses as a formation method of a microlens with the pickup lens of CD, etc. The flection 2802 of Drawing 289 can also be formed by a diffraction grating. Since other matters are the same in Drawing 280, explanation is omitted.

[0137]With the composition of Drawing 280, the refraction sheet is attached on the sealing film 73 (it arranged or forms). The refraction part 2801 is formed on the triangle, the polygon, or the circle so that the refraction sheet 2801 may correspond to the pixel 16. That is, although the refraction part 2801 presupposed that it is rugged form, this invention is not limited to this. For example, a crevice may be filled up with the refraction material 2802b so that it may illustrate to Drawing 362 (formation). Or heights may be filled up with the refraction material 2802a (formation).

[0138]The refraction part 2802a is formed with a high refractive index material (restoration), and the refraction part 2802b is formed with a low refractive index material (restoration). Or the refraction part 2802a may be formed with a low refractive index material (restoration), and the refraction part 2802b may be formed with a high refractive index material (restoration). Planar-flexion chip box material chooses 2 magnesium flux, diacid-ized silicon, 3 aluminum oxides, 2 fluoridation cerium, or silicon monoxide. A high refraction material chooses ITO3 oxidation 2 yttrium, a zirconium dioxide, diacid-ized hafnium, 5 oxidation 2 tantalum, a cerium dioxide, a titanium dioxide, zinc sulfide, or IZO.

[0139]Organic materials may be sufficient although the above is an inorganic material. For example, the acrylic resin of a fluorine system is illustrated as a planar-flexion chip box material. In addition, a fluid or gel can also be used. A refractive index is illustrated for gels, such as purity, silicon, and ethylene glycol, ethyl alcohol, methyl alcohol, etc. as or more 1.3 1.50 or less low refractive index material, and fluids, such as methyl salicylate, are illustrated as a comparatively high refractive-index material. The refraction sheet 2801 is constituted by being filled up with these etc.

[0140]If the refraction sheet 2801 is formed as shown in Drawing 362, it will become planate at the sheet 2801 and will become easy to stick a polarizing plate etc. on this flat surface. It can perform easily coating the surface with UV resin beyond 6H, etc. Therefore, the surface of the sheet 2801 can be protected. The upper and lower sides of the refraction sheet 2801 may be attached upside down so that it may illustrate to Drawing 363. If constituted in this way, the refraction part 2802a can be prevented from getting damaged mechanically. 73 may not function as a sealing film but may be operated as a protective sheet (protective film).

[0141]It is the same also in the example of Drawing 289. The heights of the refraction part 2802a may be filled up with the refraction material 2802b so that it may illustrate to Drawing 364 (formation). Or the crevice of the refraction part 2802b may be

filled up with the refraction material 2802a (formation).

[0142]Like Drawing 363, the upper and lower sides of the refraction sheet 2801 may be attached upside down so that it may illustrate to Drawing 365. If constituted in this way, the refraction part 2802a can be prevented from getting damaged mechanically. 73 may not function as a sealing film but may be operated as a protective sheet (protective film).

[0143]A vacuum evaporator uses the device which converted the commercial high vacuum evaporation apparatus (the Japan vacuum-technology incorporated company make, EBV-6DA type). the main exhaust is a turbo-molecular pump (Makoto Osaka fictitious stock type company make, TC1500) of 1500 l. of exhaust speeds / min -- a ultimate vacuum -- about 1 -- it is less than 1×10^{-6} Torr, and all the vacuum evaporation is performed in the range of 2 - 3×10^{-6} Torr. All the vacuum evaporation is good to carry out by connecting DC power supply (Kikusui electronic incorporated company make, PAK10-70A) to the resistance heating type deposition boat made from tungsten.

[0144]Thus, on the array substrate arranged in a vacuum layer, 20-50 nm of carbon films are formed. Next, a 4-(N,N-bis(p-methylphenyl)amino)-alpha-phenylstilbene is formed in about 5 nm of thickness with the evaporation rate of 0.3nm/sec as a hole injection layer.

[0145]As an electron hole transporting bed, N,N'-bis(4'-diphenylamino 4-biphenyl)-N,N'-diphenylbenzidine (made by Hodogaya chemicals incorporated company), Vapor codeposition of the 4-N,N-diphenylamino alpha-phenylstilbene was carried out with the evaporation rate of 0.3 nm/s and 0.01 nm/s, respectively, and it was formed in about 80 nm of thickness. tris(8-quinolinolato) aluminum (said -- Renhua -- study incorporated company make) is formed in about 40 nm of thickness with the evaporation rate of 0.3nm/sec as a luminous layer (electron transport layer).

[0146]next -- as an electron injection electrode -- an AlLi alloy (high grade chemicals incorporated company make.) Only Li is formed in about 1 nm of thickness with the evaporation rate of about 0.1nm/sec at low temperature from the aluminum/Li weight ratios 99/1. Then, temperature up of the AlLi alloy was carried out further, and from the state in which Li was all out, only aluminum was formed in about 100 nm of thickness with the evaporation rate of about 1.5 nm/s, and was used as the electron injection electrode of a lamination type.

[0147]Thus, the created organic thin film EL element, After leaking the inside of a vacuum evaporation tub with dry nitrogen, under a dry nitrogen atmosphere, the Corning 7059 glass closure lid 41 was stuck with the seal adhesives (sealing compound) 45 (the Anelva CORP. make, trade name super back seal 953-7000), and it was considered as the display panel. The drier 55 is arranged in the space of the closure lid 41 and the array substrate 49. It is because an organic electroluminescence film is weak to humidity as for this. The moisture which permeates the sealing compound 45 with the drier 55 is absorbed, and degradation of the organic electroluminescence film 47 is prevented.

[0148]In order to control osmosis of the moisture from the sealing compound 45, it is a good measure to lengthen the course (path) from the outside. For this reason, the detailed unevenness 43 and 44 is formed in the periphery of a viewing area in the display panel of this invention. The heights 44 formed in the periphery of the array substrate 49 are formed doubly at least. As for the interval (formed pitch) of a convex and a convex, it is preferred to form in not less than 100 micrometers 500 micrometers or less, and the height of a convex has preferred not less than 30-micrometer thing set to 300 micrometers or less. These heights are formed with the La Stampa art. This La Stampa art applies the method which OMRON Corp. has adopted as the method of micro-lens formation, the method which Matsushita Electric uses as a formation method of a microlens with the pickup lens of CD, etc.

[0149]On the other hand, the heights 43 are formed also in the closure lid 41. The formed pitch of the heights 43 is made the same as that of the formed pitch of the heights 44. Thus, the heights 44 fit into the heights 43 exactly by making the same a formed pitch with the heights 43 and 44. Therefore, the position gap with the closure lid 41 and the array substrate 49 does not occur at the time of manufacture of a display panel. The sealing compound 45 is arranged between the heights 43 and 44. The sealing compound 45 prevents permeation of the moisture from the outside while pasting up the closure lid 41 and the array substrate 49.

[0150]It is preferred to use what consists of acrylic resin with UV (ultraviolet rays) hardening type as the sealing compound 45. As for an acrylic resin, it is preferred to use what has a fluorine group. In addition, the adhesives or the binder of an epoxy system may be used. As for the refractive index of adhesives or a binder, it is preferred to use or more 1.47 1.54 or less thing. As for especially seal adhesives, it is preferred to add impalpable powder, such as impalpable powder of titanium oxide and silicon oxide, at a rate of 95% or less not less than 65% by a weight ratio. As for the particle diameter of this impalpable powder, it is preferred to consider it as the not less than 20-micrometer average diameter of 100 micrometers or less. The effect which controls penetration of the humidity from the forge-fire outside where the weight ratio of impalpable powder increases becomes high. However, if too large, air bubbles etc. will enter easily, space will become large on the contrary, and a sealing effect will fall.

[0151]As for the weight of a drier, it is preferred to carry out 0.04g or more per 10 mm in length of seal 0.2g or less. It is desirable to carry out 0.06g or more per 10 mm in length of seal 0.15g or less especially. the quantity of a drier becomes empty -- shortly after there is too nothing, there are few moisture preventive effects and an organic electroluminescence layer deteriorates. If too large, when a drier will carry out a seal, it becomes an obstacle, and a good seal cannot be performed.

[0152]Although it is the composition closed using the lid 41 of glass in drawing 4, it may be closure using a film like drawing 7. For example, using for the film of an electrolytic condenser what vapor-deposited DLC (diamond-like carbon) as a sealing film is illustrated. This film has very bad moisture perviousness (moisture proof). This film is carried out sealing film 74, and it uses. It cannot be overemphasized that the composition thing which vapor-deposits a DLC film etc. directly on the surface of the electrode 72 is good. That is, it closes with a thin film. The thickness of a thin film is n-d (n calculates those refractive indicees by making their synthesis (n-d of each thin film is calculated), when the refractive index of a thin film and two or more thin films are laminated.), d synthesizes and calculates those refractive indicees, when the thickness of a thin film and two or more thin films are laminated. It is good to make it below the luminescence dominant wavelength lambda of EL element 15 become. By satisfying this condition, the optical extraction efficiency from EL element 15 more than doubles as compared with the case where it closes with a glass substrate. The alloy, the mixture, or laminated material of aluminum and silver may be formed.

[0153]Not using the lid 41, the composition closed with the sealing film 74 is called thin film closure as mentioned above. The thin film closure in lower extraction which takes out light from the substrate 49 side forms the aluminum electrode used as a cathode on EL film after forming EL film. Next, the resin layer as a buffer layer is formed on this aluminum film. Organic

materials, such as an acrylic and epoxy, are illustrated as a buffer layer. 1-micrometer or more a thickness of 10 micrometers or less is [thickness] suitable. Not less than 2-micrometer a thickness of 6 micrometers or less is [thickness] suitable still more preferably. The sealing film 74 on this buffer film is formed. If there is no buffer film, the structure of EL film will collapse with stress and a defect will occur in the shape of a muscle. As the sealing film 74 was mentioned above, the layer system (structure which carried out multilayer vacuum evaporation of dielectric membrane and the aluminum thin film by turns) of DLC (diamond-like carbon) or an electric field capacitor is illustrated.

[0154]The thin film closure in upper extraction which takes out light from the EL layer side forms the Ag-Mg film used as a cathode by 20-Å or more 300-Å thickness on EL film after forming EL film. Moreover transparent electrodes, such as ITO, are formed and it low-resistance-izes. Next, the resin layer as a buffer layer is formed on this electrode layer. The sealing film 74 is formed on this buffer film.

[0155]It is reflected with the reflection film 46, and the half of the light generated from the organic electroluminescence layer 47 is penetrated with the array substrate 49, and is emitted. However, outdoor daylight is reflected, a reflect lump occurs and the reflection film 46 reduces display contrast. For this measure, the $\lambda/4$ board 50 and the polarizing plate 54 are arranged to the array substrate 49. When a pixel is a reflector, the light generated from EL layer 47 is emitted upward. Therefore, it cannot be overemphasized that the phase plate 50 and the polarizing plate 54 are arranged to the optical outgoing radiation side. A reflection type pixel is obtained by constituting the picture element electrode 48 from aluminum, chromium, silver, etc. An interface with an organic electroluminescence layer becomes large by providing heights (or uneven part) in the surface of the picture element electrode 48, and an emission area becomes large, and luminous efficiency improves. When the reflection film used as a cathode (anode) is formed in a transparent electrode or reflectance can be reduced to 30% or less, the circular light board is unnecessary. It is because a reflect lump decreases substantially. Interference of light is also reduced and it is desirable.

[0156]The contrast of an organic EL panel can be improved by negating the outdoor daylight reflection realized by forming a two-layer thin film in the inside of a display by optical interference. Cost can be reduced compared with the case where the conventional circular light board is used. The problem of the diffuse reflection which the circular light board was holding, and the problem of the view angle dependence of a foreground color and the thickness dependency of an organic electroluminescence luminous layer are solvable.

[0157]Between the substrate 49 and the polarizing plate (polarization film) 54, one sheet or two or more phase films (a phase plate, a phase rotating means, a phase difference plate, a phase difference film) are arranged. It is preferred to use polycarbonate as a phase film. A phase film makes emitted light generate phase contrast for incident light, and contributes to performing light modulation efficiently.

[0158]In addition, an organic resin board or organic resin films, such as polyester resin, PVA resin, polysulphone resin, vinylchloride resin, ZEONEX resin, an acrylic resin, and polystyrene resin, etc. may be used as a phase film. In addition, the crystal of crystal etc. may be used. The phase contrast of one phase plate has preferred not less than 50-nm thing set to 350 nm or less to 1 shaft orientations, and not less than 80 more nm the thing set to 220 nm or less is preferred.

[0159]It cannot be overemphasized that the circular light board 74 (circular light film) which unified the phase film and the polarizing plate so that it might illustrate to drawing 7 may be used.

[0160]As for the phase film 50, it is preferred for a color or paints to color and to give the function as a filter. The red (R) purity of especially organic electroluminescence is bad. Therefore, the fixed wavelength range is omitted with the colored phase film 50, and a color temperature is adjusted. As for a light filter, it is common to be provided by pigment dispersion type resin as a dyeing filter. Paints absorb the light of a specific wavelength band region, and penetrate the light of the wavelength band region which was not absorbed.

[0161]A part or the whole of a phase film may be colored as mentioned above, or a diffusing function may be given to the whole in part. Embossing of the surface may be carried out or an antireflection film may be formed for acid resisting. It is preferred to form a light-shielding film or a light absorption film in a part without the part or trouble which is not effective in image display, and to tighten the black level of a display image, or to demonstrate the contrast improvement effect by antihalation. A micro lens may be formed in the shape of boiled fish paste, or matrix form by forming unevenness in the surface of a phase film. A micro lens is arranged so that it may correspond to one picture element electrode or a trichromatic pixel, respectively.

[0162]Although described also in advance, the function of a phase film may be given to a light filter. For example, phase contrast can be generated, when rolling at the time of formation of a light filter or making it phase contrast arise in the fixed direction by photopolymerization. In addition, phase contrast may be given by carrying out photopolymerization of the smoothing film 71 of drawing 7. If constituted in this way, it becomes unnecessary not to constitute a phase film or to arrange it out of a substrate, the composition of a display panel becomes simple, and low cost-ization can be desired. It cannot be overemphasized that the above matter may be applied to a polarizing plate.

[0163]As a main material which constitutes the polarizing plate (polarization film) 54, a TAC film (triacyetyl cellulose film) is the optimal. A TAC film is because it has the outstanding optical property, surface smoothness, and processing suitability. About manufacture of a TAC film, it is optimal to produce with solution flow casting film production art.

[0164]The thing of the resin film in which the polarizing plate added iodine etc. to poly vinyl alcohol (PVA) resin is illustrated. Since the polarizing plate of the polarization separating means of a couple performs polarized light separation by absorbing the polarization component of the specific direction of a polarization axis, and a different direction among incident light, its utilization efficiency of light is comparatively bad. Then, the reflecting polarizer which performs polarized light separation may be used by reflecting the polarization component (reflective polarizer: reflective polarizer) of the specific direction of a polarization axis, and a different direction among incident light. If constituted in this way, the utilization efficiency of light will increase with a reflecting polarizer, and a display brighter than the above-mentioned example using a polarizing plate will be attained.

[0165]Besides such a polarizing plate or a reflecting polarizer, as a polarization separating means of this invention, For example, it is also possible to use what combined the cholesteric liquid crystal layer and $\lambda/4$ board, the thing divided into reflective polarization and transmitted polarized light using Brewster's angle, the thing using a hologram, a polarization beam splitter (PBS), etc.

[0166]The AIR coat is given to the surface of the polarizing plate 54 although not illustrated in drawing 4. The composition which

forms an AIR coat with dielectric monolayer or a multilayer film is illustrated. In addition, resin of the low refractive index of 1.35-1.45 may be applied. For example, the acrylic resin of a fluorine system, etc. are illustrated. Especially the characteristic has [a refractive index] good or more 1.37 1.42 or less thing.

[0167]An AIR coat has the composition of three layers, or two-layer composition. In the case of three layers, it is used in order to prevent reflection in the wavelength band region of large visible light, and it calls this a multi-coat. In a two-layer case, it is used in order to prevent reflection in the wavelength band region of specific visible light, and it calls this V coat. A multi-coat and V coat are properly used according to the use of a display panel. Not the thing to limit more than two-layer but one layer may be sufficient.

[0168]In the case of a multi-coat, optical thickness laminates $nd_1 = \lambda/2$, and magnesium fluoride (MgF_2) $nd_1 = \lambda/4$, and forms an aluminum oxide (aluminum $2O_3$) for $nd = \lambda/4$, and a zirconium (ZrO_2). Usually, a thin film is formed as a value of 520 nm or the neighborhood of those as λ . In the case of V coat, $nd_1 = \lambda/4$ or yttrium oxide (Y_2O_3), and magnesium fluoride (MgF_2) are laminated $nd_1 = \lambda/4$, and it forms silicon monoxide (SiO) for optical thickness $nd_1 = \lambda/4$, and magnesium fluoride (MgF_2). It is better to use Y_2O_3 , when modulating blue glow, since SiO has an absorption band region in the blue side. Since the direction of Y_2O_3 is stable also from the stability of a substance, it is desirable. SiO_2 thin film may be used. Of course, it is good also as an AIR coat using resin of a low refractive index, etc. For example, acrylic resins, such as fluoride, are illustrated. As for these, it is preferred to use an ultraviolet curing type.

[0169]In order to prevent static electricity from being charged by the display panel, it is preferred to apply resin of hydrophilic nature to the surfaces, such as a display panel. In addition, in order to prevent surface reflection, embossing may be performed on the surface of the polarizing plate 54, etc.

[0170]Although TFT is connected to the picture element electrode 48, it is not limited to this. With an active matrix, as a switching element, a thin film transistor (TFT) etc. It cannot be overemphasized that a diode method (TFD), a barista, a thyristor, ring-die oared, HOTODA oared, a photo transistor, FET, a MOS transistor, a PLZT element, etc. may be sufficient. That is, the switch element 11, the driver element 11, and the thing to constitute can use these either.

[0171]As for TFT, it is preferred to adopt LDD (low doping drain) structure. All the general element which carry out transistor operation of switching, such as FET, etc. is meant in TFT. It cannot be overemphasized that the composition of EL film, panel structure, etc. are applicable also to a simple matrix type display panel. It cannot be overemphasized that it does not limit to this although an example raises the organic EL device (OEL, PEL, PLED, OLED) 15 with this specification and it explains it as an EL element, and it is applied also to an inorganic EL element.

[0172]First, the active matrix system used for an organic electroluminescence display panel should choose the pixel of 1. specification, and gives required display information. Two conditions that current can be sent through an EL element through 2 and 1 frame period must be satisfied.

[0173]In order to satisfy these two conditions, in the element composition of the conventional organic electroluminescence shown in drawing 12, the transistor for switching for 1st TFT11a to choose a pixel and 2nd TFT11b are taken as the transistor for a drive for supplying current to EL element (EL film) 15.

[0174]Although the transistor 11a for switching is required for liquid crystals as compared with the active matrix system used for a liquid crystal here, the transistor 11b for a drive is required in order to make EL element 15 turn on. Although this reason can hold an ON state by impressing voltage in the case of a liquid crystal, it is because the lighted condition of the pixel 16 cannot be maintained if it does not continue sending current when it is EL element 15.

[0175]Therefore, in order to continue sending current, making the transistor 11b one [an EL display panel] must be continued. First, if both a scanning line and the data line are turned on, an electric charge will be accumulated in the capacitor 19 through the transistor 11a for switching. The one [current continues flowing from the current supply source line 20, and / the pixel 16] over 1 frame period in order that this capacitor 19 may continue applying voltage to the gate of the transistor 11b for a drive, even if the transistor 11a for switching is come by off.

[0176]When displaying gradation using this composition, it is necessary to impress the voltage according to gradation as gate voltage of the transistor 11b for a drive. Therefore, dispersion in the ON state current of the transistor 11b for a drive appears in a display as it is.

[0177]If the ON state current of a transistor is the transistor formed with the single crystal, it is very uniform, but. In low-temperature polycrystal galvanized iron JISUTA which the forming temperature which can be formed in a cheap glass substrate formed with the low-temperature polysilicon art of 450 degrees or less. Since dispersion in the threshold has dispersion in the range which is $\pm 0.2V-0.5V$, the ON state current which flows through the transistor 11b for a drive varies corresponding to this, and nonuniformity occurs in a display. Such nonuniformity generates not only dispersion in threshold voltage but the mobility of TFT and the thickness of gate dielectric film. The characteristic changes also with degradation of TFT11.

[0178]Therefore, in order to obtain a uniform display, it is necessary to control the characteristic of a device by the method of displaying gradation in analog, strictly, and cannot be satisfied with it of the spec. which is less than a prescribed range about this variation of stopping, in the present low-temperature polycrystal poly-Si TFT. Since this problem is solved, four transistors are provided in 1 pixel and how to make dispersion in threshold voltage compensate by a capacitor, and to acquire uniform current, the method of forming a current regulator circuit for every pixel, and attaining equalization of current, etc. can be considered.

[0179]However, since the current by which these methods are programmed is programmed through EL element 15, when a current route changes, the transistor which controls driving current to the switching transistor connected to a power source line serves as a source follower, and a drive margin becomes narrow. Therefore, it has the technical problem that driver voltage becomes high.

[0180]It is necessary to use the switching transistor linked to a power supply in the field where impedance is low, and the technical problem that it is influenced by the characteristic fluctuation of EL element 15 also has this working range. moreover, when kink current occurs in the volt ampere characteristic in a saturation region and change of the threshold voltage of a transistor occurs in it, if the memorized current value is changed to it, it will obtain to it, and a technical problem is also in it.

[0181]Even if the transistor 11 which controls the current which flows into EL element 15 does not serve as source follower composition to an aforementioned problem and the EL element structure of this invention has kink current in the transistor, It is

the composition which can make small change of the current value which can suppress the influence of kink current to the minimum, and is memorized.

[0182]The EL element structure of this invention is specifically formed of two or more transistors 11 and EL elements which a unit pixel becomes from at least four as shown in drawing 1 (a). A picture element electrode is constituted so that it may lap with a source signal line. That is, the flattening film which consists of an insulator layer or acrylic material is formed on the source signal line 18, it insulates, and a picture element electrode is formed on this insulator layer. Thus, the composition which piles up a picture element electrode is called a high aperture (HA) structure on the source signal line 18.

[0183]It lets the 1st transistor (TFT or switching element) 11a and 3rd transistor (TFT or switching element) 11c pass for the 1st gate signal line (the 1st scanning line) 17a being active (ON voltage is impressed) and by carrying out, the current value which should be passed to said EL element 15 is passed, and between the gate of the 1st transistor and a drain is short-circuited -- as -- the 2nd transistor 11b -- the 1st gate signal line 17a -- it opening being active (ON voltage is impressed) and by becoming, and. It is remembered that the gate voltage (or drain voltage) of the 1st transistor 11a passes said current value to the capacitor (a capacitor, storage capacitance) 19 connected between the gate of the 1st transistor 11a, and sauce.

[0184]As for the sauce inter gate capacity (capacitor) 19 of the 1st transistor 11a, it is preferred to consider it as the capacity of 0.2 pF or more. As other composition, the composition which forms the capacitor 19 is also illustrated separately. That is, it is the composition which forms storage capacitance from a capacitor electrode layer, gate dielectric film, and a gate metal. It is more desirable to constitute a capacitor from the viewpoint which prevents the brightness lowering by leak of the M3 transistor 11c, and a viewpoint for stabilizing a display action separately in this way. The size of the capacitor (storage capacitance) 19 has good 0.2-pF or more thing set to 2 pF or less, and the size of the capacitor (storage capacitance) 19 has especially good 0.4-pF or more thing set to 1.2 pF or less.

[0185]what the capacitor 19 is formed in general in the non display regions between the adjoining pixels for -- this -- better -- **. Generally, when creating full color organic electroluminescence, in order to form an organic electroluminescence layer by the mask deposition by a metal mask, the formation position of the EL layer by mask position gap occurs. When a position gap occurs, there is a danger that the organic electroluminescence layer of each color will lap. Therefore, not less than 10micro of non display regions between the pixels which each color adjoins must be left. This portion turns into a portion which does not contribute to luminescence. Therefore, it becomes an effective means for the improvement in a numerical aperture to form the storage capacitance 19 in this field.

[0186]The metal mask 2881 is produced with a magnetic body, and adsorbs the metal mask 2881 magnetically with a magnet from the rear face of the substrate 49. By magnetism, the metal mask 2881 is stuck without a substrate and a crevice. The matter about the above manufacturing method is applied to other manufacturing methods of this invention.

[0187]Next, the 2nd gate signal line 17b is activated, using the 1st gate signal line 17a as inactive (OFF voltage is impressed). It operates so that it may change to the course containing the 4th transistor 11d by which the course into which current flows was connected to said 1st transistor 11a and EL element 15, and said EL element 15 and the memorized current may be sent through said EL element 15.

[0188]This circuit has the four transistors 11 in 1 pixel, and the gate of the 1st transistor M1 is connected to the sauce of the 2nd transistor M2. The gate of the 2nd transistor and the 3rd transistor M2 is connected to the 1st gate signal line 17a, the drain of M2 is connected to the sauce of M3, and the sauce of the 4th transistor M4, and the drain of M3 is connected to the source signal line 18. The gate of the transistor M4 is connected to the 2nd gate signal line 17b, and the drain of the transistor M4 is connected to the anode electrode of EL element 15.

[0189]P channel constitutes all the TFT(s) from drawing 1. Although P channel has somewhat low mobility as compared with TFT of N channel, since pressure-proofing does not generate degradation easily greatly again, either, it is desirable. However, it does not limit only to this invention constituting EL element composition from a P channel. It may constitute only from an N channel (see drawing 42, drawing 43, drawing 67, etc.). It may constitute using both N channel and P channel.

[0190]The 3rd and 4th transistors are constituted from same polarity, and it constitutes from an N channel, and, as for the 1st and 2nd transistors, constituting from a P channel is preferred. Generally P channel transistor has a large effect which uses the 1st transistor 11a as P channel to the EL element which obtains the target luminescence intensity by there being the features, like reliable there is little kink current, and controlling current as compared with N channel transistor.

[0191]Following The EL element composition of this invention is explained using drawing 13. The EL element composition of this invention is controlled by two timing. The 1st timing is timing which makes a required current value memorize. When TFT11b and TFT11c turn on to this timing, it becomes drawing 13 (a) as an equivalent circuit. Here, the predetermined current I1 is written in from a signal wire. Thereby, TFT11a will be in the state where the gate and the drain were connected, and the current I1 will flow through it through this TFT11a and TFT11c. Therefore, the voltage of the gate sauce of TFT11a turns into the voltage V1 that I1 flows.

[0192]TFT11a and TFT11c close the 2nd timing, it is the timing which TFT11d opens and the equivalent circuit at that time serves as drawing 13 (b). The voltage V1 between the sauce gates of TFT11a becomes [being held with as, and]. In this case, the transistor 11a of M1 becomes constant [the current of I1] in order to always operate in a saturation region.

[0193]The gate of the transistor 11a and the gate of the transistor 11c are connected to the same gate signal line 11a. However, the gate of the transistor 11a and the gate of the transistor 11c may be connected to the different gate signal line 11 (it enables it to control SA1 and SA2 individually). That is, a 1-pixel gate signal line becomes three (the composition of drawing 1 is two). By controlling individually the ON/OFF timing of the gate of the transistor 11a, and the ON/OFF timing of the gate of the transistor 11c, the current value variation of EL element 15 by dispersion in the transistor 11 can be reduced further.

[0194]The 1st gate signal line 17a and 2nd gate signal line 17b are carried out in common, and if it is the conductivity type (N channel and P channel) which differed in the 3rd and 4th transistors, simplification of a drive circuit and the numerical aperture of a pixel can be raised.

[0195]If constituted in this way, as operation timing of this invention, the write-in course from a signal wire will be come by off. That is, when predetermined current is memorized, if the course into which current flows has branching, an exact current value will not be memorized by the sauce inter gate capacity (capacitor) of M1. By using TFTM3 and TFTM4 as different conducted type of current, after M3 certainly turns off to the timing from which a scanning line changes by controlling a mutual threshold, it

enables M4 one.

[0196]However, since it is necessary to control a mutual threshold correctly in this case, cautions of a process are required. Although the circuit described above is realizable with at least four transistors, Even if cascade connection of the transistor 11e (M5) is carried out for Miller-effect reduction as shown in drawing 1 (b) and the total of a transistor becomes four or more so that more exact timing may control or mention later, the principle of operation is the same. Thus, by having composition which added the transistor 11e, the current programmed via the transistor M3 can pass now with more sufficient accuracy to EL element 15.

[0197]In the composition of drawing 1, it is still more preferred that the current value I_{ds} in the saturation region of the 1st transistor 11a satisfies the conditions of a lower type. In a lower type, the value of λ satisfies or less 0.06 0.01 or more conditions between the adjoining pixels.

[0198] $I_{ds}=k(V_{gs}-V_{th})^2(1+V_{ds}\lambda)$

In this invention, although the working range of the transistor 11a is limited to a saturation region, it separates from the transistor characteristics in a saturation region from the ideal characteristic, and they are generally influenced by the voltage between source drains. This effect is called Miller effect.

[0199]The case where the shift of the threshold as for which ΔV_t becomes each transistor 11a in the adjoining pixel occurs is considered. In this case, the current value memorized is the same. If the shift of a threshold is set to ΔL , abbreviation $\Delta V\lambda$ is equivalent to a gap of the current value of EL element 15 by changing the threshold of the transistor 11a. Therefore, it turns out that λ must be below $0.01x/y$ noting that $y(V)$ is permitted between the pixels which adjoin the permissible dose of a shift of a threshold, in order to suppress a gap of current below to x (%).

[0200]This acceptable value changes with the luminosity of application. If the amount of change has not less than 2% of luminosity in the brightness area from $100\text{-cd}/\text{m}^2$ to $1000\text{-cd}/\text{m}^2$, human being will recognize the changed boundary line. Therefore, it is required for the amount of change of luminosity (current amount) to be less than 2%. When luminosity is higher than $100\text{ cd}/\text{cm}^2$, the luminance variation of the adjoining pixel will be not less than 2%. When using EL display device of this invention as a display for personal digital assistants, the demand luminosity is a $100\text{-cd}/\text{m}^2$ grade. When the pixel configuration of drawing 1 was actually made as an experiment and change of the threshold was measured, the adjoining pixel transistor 11a Set and it turned out that the maximum of change of a threshold is 0.3V. Therefore, in order to suppress change of luminosity within 2%, λ must be 0.06 or less. However, it is not necessary to carry out to 0.01 or less. It is because human being cannot recognize change. In order to attain the variation in this threshold, it is necessary to enlarge transistor size enough, and it is unreal.

[0201]It is preferred to constitute so that the current value I_{ds} in the saturation region of the 1st transistor 11a may satisfy a lower type. It may be 1% or more 5% or less between the pixels which change of λ adjoins.

[0202] $I_{ds}=k(V_{gs}-V_{th})^2(1+V_{ds}\lambda)$

If λ of the above-mentioned formula has change even when change of a threshold does not exist even if between the adjoining pixels, the current value which flows through EL will be changed. In order to suppress change within $\pm 2\%$, change of λ must be suppressed to $\pm 5\%$. However, it is not necessary however, to make it to 1% or less. It is because human being cannot recognize change. In order to attain 1% or less, it is necessary to enlarge transistor size fairly, and it is unreal.

[0203]According to an experiment, an array trial production, and examination, it is preferred that the channel length of the 1st transistor 11a sets to not less than 10 micrometers 200 micrometers or less. It is preferred that the channel length of the 1st transistor 11a sets to not less than 15 micrometers 150 micrometers or less still more preferably. This is considered to be because for an electric field to be eased and for a kink effect to be low suppressed, when the grain boundaries included in a channel increase in number when channel length L is lengthened.

[0204]The transistor 11 which constitutes a pixel is formed by the poly-Si TFT formed by the laser recrystallization method (laser annealing), and it is preferred that the direction of the channel in all the transistors is the same direction to the direction of radiation of laser.

[0205]Dispersion in transistor characteristics proposes the circuitry which does not affect a display, and four or more transistors are [therefore] required for the purpose of an invention of this patent. If the characteristic of four transistors does not gather when these transistor characteristics determine a circuit constant, it is difficult to ask for a suitable circuit constant. To the major axis direction of laser radiation, by the case where the direction of a channel is level, and the case of being vertical, the threshold and mobility of transistor characteristics differ from each other, and are formed. The grade of dispersion is the same in both cases. Horizontally, if perpendicular, the average value of μ of mobility and a threshold differs. Therefore, the more nearly same one of the direction of a channel of all the transistors which constitute a pixel is desirable.

[0206]When C_s and the OFF state current value of the 2nd transistor 11b are set to I_{off} for the capacity value of the storage capacitance 19, it is preferred to satisfy a following formula.

[0207] 3 It is preferred to satisfy a following formula to $C_s/I_{off} < 24$ pan preferably.

[0208] 6 By setting the OFF state current of the $C_s/I_{off} < 18$ transistor 11b to 5 or less pA, it is possible to suppress change of the current value which flows through EL to 2% or less. This is because the electric charge stored between gate source (both ends of a capacitor) in the voltage non-writing state cannot be held between 1 fields, when leakage current increases. Therefore, if the capacity for accumulation of the capacitor 19 is large, the permissible dose of the OFF state current will also become large. Change of the current value between adjacent pixels can be suppressed to 2% or less by filling said formula.

[0209]It is preferred that the transistor which constitutes an active matrix is constituted by the p-ch polysilicon thin film transistor, and the transistor 11b considers it as the multi-gate structure which is more than a dual gate. In order that the transistor 11b may act as a switch between the source drains of the transistor 11a, the characteristic that an ON/OFF ratio is high as much as possible is required. The high characteristic of an ON/OFF ratio is realizable by making structure of the gate of the transistor 11b into the multi-gate structure beyond dual gate structure.

[0210]The transistor which constitutes an active matrix comprises a polysilicon thin film transistor, and it is preferred that below 54-micrometer^2 carries out (channel width W) * (channel length L). [of each transistor] (Channel width W) * (channel length L) and the variation of transistor characteristics have correlation. The cause of dispersion in transistor characteristics has a large

thing resulting from dispersion in the energy by the exposure of laser, etc., therefore in order to absorb this, it is desirable. [of the structure which contains many exposure pitches (generally about ten micrometers) of laser by the inside of a channel as much as possible] By below 54-micrometer² carrying out (channel width W) * (channel length L), there is no dispersion resulting from laser radiation, and the thin film transistor to which the characteristic was equal can be obtained. [of each transistor] If transistor size becomes small too much, characteristic dispersion by area will occur. Therefore, it is made for (channel width W) * (channel length L) to become more than 9-micrometer². [of each transistor] As for (channel width W) * (channel length L), it is preferred to make it below 45-micrometer² become [more than 16 micrometer²] still more preferably. [of each transistor] [0211] Things are [making it mobility change of the 1st transistor 11a in the adjoining unit pixel be 20% or less] preferred. When mobility runs short, by the time the charging capacity of a switching transistor deteriorates and it passes a current value required for within a time, capacity between the gate sauce of M1 cannot be charged. Therefore, dispersion in the luminosity between pixels can be made below into ***** by suppressing dispersion in movement within 20%.

[0212] Although the pixel configuration explained the above explanation as composition of drawing 1, the above matter is applicable also to the composition illustrated to drawing 21, drawing 43, drawing 71, and drawing 22. Hereafter, composition, operation, etc. are explained about pixel configurations, such as drawing 21.

[0213] When setting up the current sent through EL element 15, voltage between gate sauce which produces the signal current sent through TFT11a in TFT11a as a result of [its] I_w is set to V_{gs} . Since between the gate drains of TFT11a has connected too hastily by TFT11d at the time of writing, the TFT11a operates in a saturation region. Therefore, I_w is given by the following formulas.

[0214]

$$I_w = \mu_1 \cdot C_{ox1} \cdot W_1/L_1 \cdot (V_{gs} - V_{th1})^2 \quad (1)$$

Here, C_{ox} is the gate capacitance per unit area, and is given by $C_{ox} = \epsilon_0 \cdot \epsilon_r / d$. The mobility of a career and W show channel width, L shows channel length, as for the threshold and μ which are TFT as for V_{th} , vacuous mobility and ϵ_r show the specific inductive capacity of gate dielectric film, as for ϵ_0 , and d is the thickness of gate dielectric film.

[0215] A current level will be controlled by TFT1b by which I_{dd} is connected in series with EL element 15 if the current which flows into EL element 15 is set to I_{dd} . In this invention, since the voltage between the gate sauce is in agreement with V_{gs} of (1) type, if it assumes that the TFT1b operates in a saturation region, the following formulas will be realized.

[0216]

$$I_{drv} = \mu_2 \cdot C_{ox2} \cdot W_2/L_2 \cdot (V_{gs} - V_{th2})^2 \quad (2)$$

Generally conditions for the insulated-gate electric field effect type thin film transistor (TFT) to operate in a saturation region are given by the following formulas by making V_{ds} into the voltage between drain sauce.

[0217]

$$|V_{ds}| > |V_{gs} - V_{th}| \quad (3)$$

Here, since the inside of a small pixel is approached and it is formed, TFT11a and TFT11b are profile $\mu_1 = \mu_2$ and $C_{ox1} = C_{ox2}$, and unless creativity in particular is put, they are considered to be $V_{th1} = V_{th2}$. Then, the following formulas are easily drawn from (1) type and (2) types at this time.

[0218]

$$I_{drv}/I_w = (W_2/L_2)/(W_1/L_1) \quad (4)$$

Although it is common in (1) type and (2) types to vary for every pixel, every product, or every manufacture lot as for the value of μ , C_{ox} , and V_{th} itself, the point which it should be careful of here, (4) Since a formula does not contain these parameters, I hear that it is not dependent on these dispersion, and there is a value of I_{drv}/I_w .

[0219] If it designs with $W_1 = W_2$ and $L_1 = L_2$, $I_{drv}/I_w = 1$, i.e., I_w and I_{drv} , will become the same value. That is, since the driving current I_{dd} which is not based on characteristic dispersion of TFT but flows into EL element 15 becomes the same as that of the signal current I_w correctly, it can control the light emitting luminance of EL element 15 correctly as a result.

[0220] Since [as mentioned above,] V_{th1} of TFT11a for conversion and V_{th2} of TFT11b for a drive are fundamentally the same -- both TFT(s) -- if the signal level of a cutoff level is impressed to the gate which is in the common electric potential of ** mutually -- TFT11a and TFT11b -- it must be in both non-switch-on -- it comes out. However, V_{th2} may become low rather than V_{th1} by factors, such as dispersion in a parameter, also within a pixel actually. At this time, since the leakage current of subthreshold level flows into TFT11b for a drive, EL element 15 presents fine luminescence. The contrast of a screen falls by this fine luminescence, and display properties are spoiled.

[0221] Especially in this invention, it has set up so that threshold voltage V_{th2} of TFT11b for a drive may not become lower than threshold voltage V_{th1} of TFT11a for conversion corresponding within a pixel. For example, even if gate length L_2 of TFT11b is made longer than the gate length L_1 of TFT11a and it changes the process parameter of these thin film transistors, V_{th2} is kept from becoming lower than V_{th1} . It is possible for this to control very small current leakage. The above matter is applied also to TFT11a of drawing 1, and the relation of TFT11d.

[0222] Transistor TFT11 for conversion a into which signal current flows as shown in drawing 21, Transistor TFT11 for drive b etc. which control the driving current which flows into the light emitting device which consists of EL element 15 grade. Transistor TFT11 for taking in c which connects or intercepts a pixel circuit and data-line data by control of the 1st scanning line scanA (SA), By control of the 2nd scanning line scanB (SB). It comprises the capacity C19 for after a write end to hold the voltage between gate sauce of transistor TFT11d for a switch and TFT11a which short-circuit the gate drain of TFT111a during a write-in period, EL element 15 as a light emitting device, etc. Therefore, since gate signal lines are each two pixels, they can apply the composition of the whole specification of this invention explained by drawing 1, drawing 2, drawing 3, etc. which were explained above, a function, operation, etc.

[0223] Although TFT11c consists of drawing 21 and the transistor of N-channel MOS (NMOS) and others is constituted from a P channel MOS (PMOS), this needs to be an example and does not necessarily need to be this passage. Although the terminal of one of these is connected to the gate of TFT11a and the terminal of another side is connected to V_{dd} (power supply potential), constant potential not only V_{dd} but arbitrary may be sufficient as the capacity C. The cathode (negative pole) of EL element 15

is connected to earth potentials. Therefore, it cannot be overemphasized that the above matter is applied to drawing 1 etc.

[0224]The terminal voltage of EL element 15 changes also with temperature. Usually, it becomes low as it is high and temperature becomes high, when temperature is low. This tendency has a linear relation. Therefore, it is preferred to adjust Vdd voltage with an outside temperature (correctly temperature of EL element 15). A temperature sensor detects an outside temperature, feedback of a Vdd voltage generation section is applied, and Vdd voltage is changed. Vdd voltage is Centigrade 10 ** change, and it is preferred to make it change 8% or less not less than 2%. It is preferred to consider it as 6% or less not less than 3% especially.

[0225]As for Vdd voltage, such as drawing 1, it is preferred to make it lower than the OFF state voltage of TFT11. Specifically, Vgh (OFF state voltage of a gate) should be made higher than $V_{dd}-0.5(V)$ at least. When lower than this, off-leak of TFT occurs and the shot nonuniformity of laser annealing comes to be conspicuous. It should be made lower than $V_{dd}+4(V)$. If too high, the amount of off-leaks will increase conversely. therefore, the OFF state voltage (the voltage side near [in drawing 1] Vgh, i.e., power supply voltage) of a gate — power supply voltage (drawing 1 Vdd) — also depending — it should consider as +4 or less (V) -0.5 or more-(V). The power supply voltage (drawing 1 Vdd) should also make the twist still more preferably +2 or less (V) 0 or more-(V). That is, it is made for the OFF state voltage of TFT impressed to a gate signal line to be enough come by off. When TFT is n channel, Vgl serves as OFF state voltage. Therefore, it is made for Vgl to serve as the -4 or more (V) range of 0.5 or less (V) to GND voltage. -2 or more (V) the thing to do for the range of 0 or less (V) is still more preferably preferred.

[0226]Although the above matter described the pixel configuration of the current programming of drawing 1, it cannot be overemphasized that it does not limit to this and can apply also to the pixel configuration of voltage programs, such as drawing 54, drawing 67, and Drawing 103. As for Vt offset cancellation of a voltage program, it is preferred to compensate every R, G, and B individually.

[0227]The composition of drawing 21 is provided with the following.

The scanning line driving circuit which chooses the scanning lines scanA and scanB one by one.

The data line driving circuit containing current source CS which generates the signal current Iw which has a current level according to brightness information, and is supplied to data-line data one by one.

Two or more pixels which it is allotted to the intersection of each scanning lines scanA and scanB and each data-line data, and contain current drive type EL element 15 which emits light in response to supply of driving current.

[0228]As feature items, the pixel configuration shown in drawing 21, The accession department which incorporates the signal current Iw from the data-line data concerned when the scanning line scanA concerned is chosen, It consists of a converter which once transforms the current level of the incorporated signal current Iw into a voltage level, and holds it, and an actuator which sends the driving current which has a current level according to the held voltage level through the light emitting device OLED15 (it may otherwise be called EL, OEL, PEL, and PLED for short) concerned. Specifically, said accession department consists of transistor TFT11for taking in c.

[0229]Said converter contains the capacity C connected with thin film transistor TFT11a for conversion provided with a gate, sauce, the drain, and the channel at the gate. A gate is made to generate the voltage level which sent through the channel the signal current Iw incorporated by thin film transistor TFT11for conversion a, and the accession department, and was changed, and the voltage level produced in capacity C19-TO is held.

[0230]Said converter contains thin film transistor TFT11d for a switch inserted between the thin film transistor TFT11a drain for conversion, and the gate. Thin film transistor TFT11d for switching flows, when transforming the current level of the signal current Iw into a voltage level, the drain and gate of thin film transistor TFT11a for conversion are electrically connected, and the gate of TFT11a is made to produce the voltage level on the basis of sauce. Thin film transistor TFT11d for a switch is intercepted when holding a voltage level in the capacity C, and it separates the capacity C19 linked to the gate of thin film transistor TFT11a for conversion, and this from the drain of TFT11a.

[0231]Said actuator contains thin film transistor TFT11b for a drive provided with a gate, a drain, sauce, and a channel. The driving current which thin film transistor TFTb for a drive accepts in a gate the voltage level held at the capacity C19, and has a current level according to it is sent through EL element 15 via a channel. The gate of thin film transistor TFT11a for conversion and the gate of thin film transistor TFT11b for a drive are connected directly, and he constitutes a current mirror circuit, and is trying for the current level of the signal current Iw and the current level of driving current to serve as proportionality.

[0232]The thin film transistor TFT11b for a drive operates in a saturation region, and sends through EL element 15 the driving current according to the difference of the voltage level and threshold voltage which were impressed to the gate.

[0233]Thin film transistor TFT11b for a drive is set up so that the threshold voltage may not become lower than the threshold voltage of thin film transistor TFT11a for conversion corresponding within a pixel. Specifically, TFT11b is set up so that the gate length may not become shorter than the gate length of TFT11A. Or TFT11b may be set up so that the gate dielectric film may not become thinner than the gate dielectric film of TFT11a corresponding within a pixel.

[0234]Or TFT11b may adjust the impurity concentration poured into the channel, and it may set it up so that threshold voltage may not become lower than the threshold voltage of TFT11a corresponding within a pixel. As for TFT11a and TFT11b, both should be turned off, if the signal level of a cutoff level is impressed to the gate of both the thin film transistors by which common connection was carried out when it sets up temporarily so that the threshold voltage of TFT11a and TFT11b may become the same. However, dispersion in a process parameter is also in a pixel slightly actually, and the threshold voltage of TFT11b may become low from the threshold voltage of TFT11a.

[0235]At this time, since the weak current of subthreshold level flows into TFT11b for a drive also with the signal level below a cutoff level, EL element 15 fine-emits light and the contrast drop of a screen appears. Then, gate length of TFT11b is made longer than the gate length of TFT11a. Even if it changes the process parameter of a thin film transistor within a pixel, the threshold voltage of TFT11b is kept from becoming lower than the threshold voltage of TFT11a by this.

[0236]In gate length L, in the comparatively short short-channel-effect field A, Vth goes up with the increase in gate length L. On the other hand, gate length L is not concerned with gate length L in the comparatively big suppression region B, but Vth is almost constant. Gate length of TFT11b is made longer than the gate length of TFT11a using this characteristic. For example, when the gate length of TFT11a is 7 micrometers, the gate length of TFT11b shall be about 10 micrometers.

[0237]While the gate length of TFT11a belongs to the short-channel-effect field A, the gate length of TFT11b may be made to belong to the suppression region B. Thereby, while being able to inhibit the short channel effect in TFT11b, the threshold voltage reduction by change of a process parameter can be controlled. By the above, the leakage current of the subthreshold level which flows into TFT11b can be controlled, fine luminescence of EL element 15 can be suppressed, and it can contribute to a contrast improvement.

[0238]The drive method of the pixel circuit shown in drawing 21 is explained briefly. First, at the time of writing, the 1st scanning line scanA and the 2nd scanning line scanB are made into a selective state. By connecting current source CS to data-line data, where both scanning lines are chosen, the signal current I_w according to brightness information flows into TFT11a. Current source CS is a variable current source controlled according to brightness information. At this time, since it has connected too hastily electrically by TFT11d between the gate drains of TFT11a, (3) types are materialized, and the TFT11a operates in a saturation region. Therefore, between the gate sauce, the voltage V_{gs} given by (1) formula arises.

[0239]Next, scanA and scanB are changed into a non selection state. In detail, TFT11d is first changed into an off state by making scanB into a low. V_{gs} is held by this with the capacity C19. Next, since a pixel circuit and data-line data are electrically intercepted by making scanA into a high level and setting to OFF, the writing to another pixel can be performed via data-line data after that. Here, the data which current source CS outputs as a current level of signal current needs to be effective when scanB serves as non selection, but it may be used as arbitrary levels (for example, write data of the following pixel) after that.

[0240]Since common connection of TFT11a, a gate, and the sauce is carried out [both], and TFT11b approaches the inside of a small pixel and is formed, If the TFT11b is operating in the saturation region, the current which flows through TFT11b will be given by (2) formulas, and will turn into the driving current I_{dd} which flows into this [15], i.e., an EL element. What is necessary is just to give sufficient power supply potential to V_{dd} so that (3) types may be materialized in addition even if it takes into consideration the voltage drop in EL element 15 in order to operate TFT11b in a saturation region.

[0241]Like drawing 1 (b) etc., in order to increase impedance, it cannot be overemphasized that TFT11e and 11 f may be added so that it may illustrate [purpose] to drawing 22. Thus, a better current drive is realizable by adding TFT11e and 11 f. drawing 1 explains other matters -- it comes out and omits.

[0242]Thus, direct current voltage was impressed to EL display device explained by produced drawing 1, drawing 21, etc., and the continuation drive was carried out by the constant current density of 10 mA/cm². EL structure has checked green (luminescence maximum wavelength $\lambda_{max} = 460$ nm) luminescence of two of 7.0V and 200cds/cm. A blue light part is luminosity 100cd/cm², and a color coordinate $x = 0.129$, $y = 0.105$, and a green emission part, By luminosity 200 cd/cm², in $x = 0.340$, $y = 0.625$, and a red light part, a color coordinate is luminosity 100cd/cm², and the color coordinate was acquired for the luminescent color of $x = 0.649$ and $y = 0.338$.

[0243]Henceforth, the display, display module and information display device using drawing 1, drawing 21, drawing 43, drawing 71, drawing 22, etc., a drive circuit, a drive method for the same, etc. are explained.

[0244]In a full color organic electroluminescence display panel, improvement in a numerical aperture becomes an important developing theme. It is for the utilization efficiency of light increasing and leading to a rise in luminosity or reinforcement, if a numerical aperture is raised. What is necessary is just to make small area of TFT which interrupts the light from an organic electroluminescence layer, in order to raise a numerical aperture. Low-temperature polycrystal Si-TFT has one 10 to 100 times the performance of this as compared with an amorphous silicon, and since the serviceability of current is high, it can make the size of TFT very small. Therefore, it is preferred to produce a picture element transistor and a circumference drive circuit with low-temperature-polysilicon art in an organic electroluminescence display panel. Of course, although it may form with amorphous silicon art, a pixel numerical aperture will become quite small.

[0245]By forming drive circuits, such as the gate driver 12 or the source driver 14, on the glass substrate 46, the resistance which becomes a problem especially with the organic electroluminescence display panel of a current drive can be lowered. The connection resistance of TCP is lost, and also the leading line from an electrode becomes short 2-3 mm compared with the case of TCP connection, and wiring resistance becomes small. Suppose that there is an advantage whose process for TCP connection is lost that material cost falls.

[0246]Next, the EL display panel or EL display of this invention is explained. Drawing 2 is an explanatory view centering on the circuit of an EL display. The pixel 16 is arranged or formed in matrix form. The source driver 14 which outputs the current which performs current programming of each pixel to each pixel 16 is connected. The current mirror circuit corresponding to the number of bits of the video signal in the output stage of the source driver 14 is formed. For example, if it is 64 gradation, 63 current mirror circuits are formed in each source signal line, and it is constituted by choosing the number of these current mirror circuits so that desired current can be impressed to the source signal line 18.

[0247]The minimum output current of one current mirror circuit is set to 10 or more nA50nA. Especially the minimum output current of a current mirror circuit is good to use 15 or more nA35nA. It is for securing the accuracy of the transistor which constitutes the current mirror circuit in the driver IC 14.

[0248]The precharge or the discharging circuit which emits or charges the electric charge of the source signal line 18 compulsorily is built in. As for the precharge which emits or charges the electric charge of the source signal line 18 compulsorily, or the voltage (current) output value of a discharging circuit, it is preferred to constitute so that it can set up independently by R, G, and B. the threshold of EL element 15 -- RGB -- things -- he is ** et al.

[0249]It cannot be overemphasized that a pixel configuration, array constitution, panel structure, etc. which were explained above are applied to the composition, method, and device which are explained below. It cannot be overemphasized that a pixel configuration, array constitution, panel structure, etc. which already explained the composition, method, and device which are explained below are applied.

[0250]It is known that an organic EL device has the big temperature dependence characteristic (temperature dependency characteristics). In order to adjust the light-emitting-luminance change by these temperature dependency characteristics, nonlinear elements, such as a thermo sensitive register to which output current is changed, or posistor, are added to a current mirror circuit, and reference current is created in analog by adjusting change by temperature dependency characteristics with said thermo sensitive register.

[0251]In this case, since it is uniquely determined by the EL material to choose, it is not necessary to carry out soft control of

the microcomputer etc. in many cases. That is, it may fix to a fixed shift amount etc. with a liquid crystal material. It is important that temperature dependency characteristics change with luminescent color materials, and it is the point that it is necessary to perform optimal temperature-dependency-characteristics compensation to every luminescent color (R, G, B).

[0252]It is necessary to carry out the temperature dependency characteristics of each EL element of R, G, and B into a fixed range. It cannot be overemphasized that it is preferred that there are no temperature dependency characteristics of EL element 15 of R, G, and B. at least -- the temperature-dependency-characteristics direction of R, G, and B -- a uniform direction -- or it is made not to change Change is change of 10 ** of each color Centigrade, and it is preferred to make it change 8% or less not less than 2%. It is preferred to consider it as 6% or less not less than 3% especially.

[0253]A microcomputer may perform temperature-dependency-characteristics compensation. The temperature of an EL display panel is measured with a temperature sensor, and it is made to change with the measured temperature with a microcomputer (not shown) etc. It may control to change reference current etc. automatically by microcomputer control etc. at the time of a change, and to be able to display a specific menu indication. It can constitute so that it can change using a mouse etc. It may constitute so that it can change by using the display screen of an EL display as a touch panel, and displaying a menu, and pressing down a specified part.

[0254]In this invention, a source driver is formed with a semiconductor silicon chip, and is connected with the terminal of the source signal line 18 of the substrate 46 with glass art on chip (COG). As for wiring of signal wires, such as the source signal line 18, metallic wiring, such as chromium, aluminum, and silver, is used. It is because wiring of low resistance is obtained with thin wiring width. Wiring is the material which constitutes the reflection film of a pixel, when a pixel is a reflection type, and forming simultaneously with a reflection film is preferred. It is because it can carry out simple [of the process].

[0255]This invention is good also as composition which does not limit to COG technology, loaded the above-mentioned driver IC 14 etc. into chip one film (COF) art, and was connected with the signal wire of the display panel. Drive IC produces power supply IC102 separately, and is good also as 3 chip configurations.

[0256]A TCF tape may be used. The film for TCF tapes can bond a polyimide film and copper (Cu) foil by thermo-compression, without using adhesives. In addition to this, there are a method which carries out cast molding of the polyimide which dissolved on Cu foil in piles, and a method which attaches Cu by plating or vacuum evaporation on the metal membrane which formed by sputtering on the polyimide film in the film for the TCP tapes which attach Cu to a polyimide film without using adhesives. Although these any may be sufficient, the method of using the TCP tape which attaches Cu to a polyimide film without using adhesives is the most preferred. It corresponds to a lead pitch of 30 micrometers or less with Cu beam laminate sheet not using adhesives. Since the method of forming a Cu layer by plating or vacuum evaporation among Cu beam laminate sheets not using adhesives is suitable for slimming down of the Cu layer, it is advantageous to the minuteness making of a lead pitch.

[0257]On the other hand, the gate driver circuit 12 is formed with low-temperature-polysilicon art. That is, it forms in the same process as TFT of a pixel. This is because an internal structure is easy as compared with the source driver 14 and clock frequency is also low. Therefore, even if it forms with low-temperature polysilicon art, it can form easily, and narrow picture frame-ization can be realized. Of course, it cannot be overemphasized that the gate driver 12 may be formed with a silicon chip, and it may mount on the substrate 46 using COG technology etc. Switching elements, such as the pixel TFT, a gate driver, etc. may be formed by elevated-temperature polysilicon technology, and may be formed with organic materials (organic TFT).

[0258]The gate driver 12 contains the shift register 22b the shift register 22a of **, and for the gate signal line 17a gate signal lines 17b. Each shift register 22 is controlled by the clock signal (CLKxP, CLKxN) of a non-inverter and a negative phase, and a start pulse (STx). In addition, it is preferred to add the enabling (ENABL) signal which controls the output of a gate signal line and a non output, and the up-and-down (UPDWM) signal which carries out the up-and-down inversion of the shift direction. It is preferred to provide the output terminal etc. which otherwise check that the start pulse is shifted and outputted to the shift register. The shift timing of a shift register is controlled by the control signal from control IC (not shown). The level shift circuit which performs the level shift of external data is built in. An inspecting circuit is built in.

[0259]Since the buffer capacity of the shift register 22 is small, the gate signal line 17 cannot be driven directly. Therefore, between the output gates 24 which drive the output and the gate signal line 17 of the shift register 22, at least two or more inverter circuits 23 are formed.

[0260]it is also the same as when forming the source driver 14 directly on the substrate 46 with polysilicon art, such as low-temperature polysilicon, and two or more inverter circuits are formed between the gate of analog switches, such as a transfer gate which drives a source signal line, and the shift register of a source driver. The following matters (the output of a shift register and the output stage (matter about the inverter circuit arranged among output stages, such as an output gate or a transfer gate) which drives a signal wire are matters common to a source drive and a gate drive circuit.) For example, in drawing 2, illustrated as the output of the source driver 14 was directly connected to the source signal line 18, but. Actually, as for the output of the shift register of a source driver, a multi stage inverter circuit is connected and the output of the inverter is connected to the gate of analog switches, such as a transfer gate.

[0261]The inverter circuit 23 comprises a MOS transistor of P channel, and a MOS transistor of N channel. As explained also in advance, the inverter circuit 23 is connected to the outgoing end of the shift register circuit 22 of the gate driver circuit 12 in multistage, and the final output is connected to the output gate 24. The inverter circuit 23 may consist of only P channels. However, it may constitute not as an inverter but as a mere gate circuit in this case.

[0262]The channel width of TFT of P channel which constitutes each inverter circuit 23, or N channel W, Channel length is set to L (in on double-gate **, the width or channel length of a channel who constitutes is added), and the degree of the inverter near the 1 and display side is set to N (eye N stage) for the degree of the inverter near a cyst register.

[0263]Multiplex [of the characteristic difference of the inverter 23 connected if there are many connection number of stageses of the inverter circuit 23] (piled up) is carried out, and a difference arises from the shift register 22 in the transfer time to the output gate 24 (time delay variation). In the case of being extreme, to for example, that [one / the output gate 24a / in drawing 2 / (output voltage has changed) / that / 1.0microsec backward (measuring, after a pulse is outputted from a shift register)]. The state, one [the output gate 24b / 1.5microsec backward (measuring, after a pulse is outputted from a shift register)] (output voltage has changed), arises.

[0264]Therefore, although a direction with more than [little / inverter circuit / 23 / which is produced between the shift

register 22 and the output gate 24] is good, gate width W of the channel of TFT which constitutes the output gate 24 is dramatically large. The gate driving ability of the output stage of the cyst register 22 is small. Therefore, it is impossible to drive the output gate 24 directly in the gate circuits (NAND circuit etc.) which constitute a shift register. Therefore, although it is necessary to carry out multi stage connection of the inverter, For example, if the ratio of the size of W_4/L_4 (channel length of the channel width / P channel of P channel) of the inverter 23d of drawing 2 to the size of W_3/L_3 of the inverter 23c is large, a time delay will become long and variation will also become [the characteristic of an inverter] large.

[0265]The relation between time delay variation (a dotted line shows) and a time delay ratio (a solid line shows) is shown in drawing 3. $(W_{n-1}/L_{n-1}) / (W_n/L_n)$ shows a horizontal axis. For example, L of the inverter 23d and the inverter 23c is the same at drawing 2, and if it is $2W_3=W_4$ (W_3/L_3), it is $/(W_4/L_4) = 0.5$. In the graph of drawing 3, a time delay ratio sets the time of $(W_{n-1} / L_{n-1}) / (W_n/L_n) = 0.5$ to 1, and is setting time variation as well as delay to 1.

[0266]It is shown that the connection number of stages of the inverter 23 increases, and time delay variation becomes large, so that $(W_{n-1} / L_{n-1}) / (W_n/L_n)$ becomes large in drawing 3, It is shown that the time delay to the inverter 23 from the inverter 23 to the next step becomes long, so that $(W_{n-1}/L_{n-1}) / (W_n/L_n)$ becomes small. It is advantageous on a design to make a time delay ratio and time delay variation into less than two from this graph. Therefore, what is necessary is just to satisfy the conditions of a following formula.

[0267]0.25 The W/L ratio (W_p/L_p) of $\leq (W_{n-1}/L_{n-1})/(W_n/L_n) \leq 0.75$ and P channel of each inverter 23 and the W/L ratio (W_s/L_s) of n channel need to satisfy the following relations.

[0268]0.4 If the number of stages n of the inverter 23 formed between output gates (or transfer gate) from the outgoing end of a shift register at $\leq (W_s/L_s)/(W_p/L_p) \leq 0.8$ pan satisfies a following formula, there is also little variation in a time delay and it is good.

[0269]3 The $\leq n \leq 8$ mobility μ has a technical problem. If mobility μ_n of n channel transistor is small, the size of TG and an inverter will become large and power consumption etc. will become large. The forming face product of a driver becomes large. Therefore, panel size will become large. On the other hand, if large, it will be easy to cause the characteristic degradation of a transistor. Therefore, mobility μ_n has the following good ranges.

[0270]50 Make the slew rate of the clock signal in $\leq \mu_n \leq 150$ and the shift register 22 less than $500v/\text{microsec}$. When a slew rate is high, degradation of n channel transistor is intense.

[0271]A NAND circuit may be sufficient although it presupposed at the output of the shift register that the inverter 23 is connected to multistage by drawing 2. It is because an inverter can be constituted also from a NAND circuit. That is, what is necessary is just to consider the connection number of stages of a gate with the connection number of stages of the inverter 23. Relations, such as a W/L ratio explained also in this case until now, are applied. The matter explained by the above drawing 2, drawing 3, etc. is applied to drawing 60, drawing 74, drawing 84, etc.

[0272]When the switching transistor of a pixel is P channel in drawing 2 etc., as for ON state voltage, as for the output from the inverter of a final stage, V_{gl} is impressed to the gate signal line 17, and, as for OFF state voltage, V_{gh} is impressed to the gate signal line 17. Conversely, when the switching transistor of a pixel is N channel, as for OFF state voltage, as for the output from the inverter of a final stage, V_{gl} is impressed to the gate signal line 17, and, as for ON state voltage, V_{gh} is impressed to the gate signal line 17.

[0273]Although it presupposed that a gate driver is produced simultaneously with the pixel 16 with elevated-temperature polysilicon or low-temperature-polysilicon art in the above example, it does not limit to this. For example, source drivers IC 14 and gate driver IC12 produced with the semiconductor chip may be separately loaded into the display panel 82 so that it may illustrate to drawing 26.

[0274]When using the display panel 82 for information display devices, such as a cellular phone, it is preferred to mount the driver ICs 14 and 15 in one side of a display panel, as shown in drawing 26 (the gestalt which mounts a driver IC in one side still in this way is called three-side free composition (structure)). Conventionally, gate driver IC12 was mounted X neighborhood of the viewing area, and the source drivers IC 14 was mounted Y neighborhood. It is because it is easy to design the center line of Screen 21 take the lead in a display and mounting of a driver IC also becomes easy. A gate driver circuit may be produced with composition without three sides by elevated-temperature polysilicon or low-temperature-polysilicon art (it is got blocked and at least one side is directly formed in the substrate 49 by polysilicon technology among 14 and 12 of drawing 26).

[0275]With three-side free composition, not only the composition that loaded or formed IC in the substrate 49 directly but the composition which stuck on one side (or about one side) of the substrate 49 the films (TCP, TAB art, etc.) which attached ICs 14 and 12 etc. is included. That is, all similar to the composition, the arrangement, or it by which IC is not mounted or attached to two sides are meant.

[0276]If the gate driver 12 is arranged beside the source driver 14 like drawing 26, the neighborhood C meets and it is necessary to form the gate signal line 17 and to form it to the screen display region 21 (references, such as drawing 27).

[0277]The pitch of the gate signal line 17 formed C neighborhood shall be not less than 5 micrometers 12 micrometers or less. In less than 5 micrometers, a noise will ride on a contiguity gate signal line under the influence of parasitic capacitance. According to the experiment, the influence of parasitic capacitance occurs notably at 7micro or less. In less than 5 more micrometers, image noises, such as the shape of a beat, occur violently in a display screen. It is difficult for especially generating of a noise to differ by the right and left of a screen, and to reduce image noises, such as the shape of this beat. If 12 micrometers of reduction are exceeded, the frame width D of a display panel becomes large too much, and is not practical.

[0278]In order to reduce the above-mentioned image noise, it can decrease by arranging the Grant pattern (electric conduction pattern set as fixed voltage at a voltage clamp or the potential stable as a whole) in the lower layer or the upper layer of a portion in which the gate signal line 17 was formed. What is necessary is just to arrange the shield plate (shield foil (electric conduction pattern set as fixed voltage at a voltage clamp or the potential stable as a whole)) formed separately on the gate signal line 17.

[0279]Although the gate signal line 17 of C neighborhood of drawing 26 may be formed with an ITO electrode, in order to low-resistance-ize, it is preferred to laminate and form ITO and a metal thin film. Forming with a metal membrane is preferred. When laminating with ITO, a titanium film is formed on ITO and the alloy thin film of aluminum or aluminum, and molybdenum is formed on it. Or a chromium film is formed on ITO. In the case of a metal membrane, it forms with an aluminum thin film and a chrome

thin film. The above matter is the same in other examples of this invention.

[0280]In drawing 27 etc., although it presupposes that the wiring 17 is arranged in one side of a viewing area, it may not be limited to this, and it may be arranged to both. For example, the gate signal line 17a may be arranged on the right-hand side of the viewing area 21 (formation), and the gate signal line 17b may be arranged on the left-hand side of the viewing area 21 (formation). The above matter is the same in other examples.

[0281]In drawing 30, 1 chip making (1 chip driver IC14a) of source drivers IC 14 and gate driver IC12 is carried out. If 1 chip making is carried out, mounting of the IC chip to the display panel 82 can be managed with one piece. Therefore, implementation cost can also be reduced. The various voltage used within 1 chip driver IC can also be generated simultaneously.

[0282]It is not what is limited to this although source drivers IC 14 and gate driver IC12 and 1 chip driver IC14a are produced with semiconductor wafers, such as silicon, and being mounted in the display panel 82. It cannot be overemphasized that it may form in the display panel 82 directly by low-temperature-polysilicon art and elevated-temperature polysilicon technology.

[0283]drawing 28 -- the both ends of the source drivers IC 14 -- gate driver IC12a and 15b -- mounting (or it forms) -- although carried out, it is not limiting to this, either. For example, as shown in drawing 26, while adjoined the source drivers IC 14 and one gate driver IC12 may be arranged to a side. The part illustrated as the thick solid line in drawing 26 etc. shows the part which the gate signal line 17 arranged in parallel and formed. Therefore, the gate signal line 17 for the number of a scanning signal line arranges in parallel the portion (bottom of screen) of b, it is formed, and, as for the portion (upper part of a screen) of a, the one gate signal line 17 is formed.

[0284]if the two gate drivers 12a and 12b are used like drawing 28, the number of the gate signal line 17a which is arranged in parallel C neighborhood of drawing 28, and is formed will be set to one half of the number of scanning lines (the right and left of a screen -- 1/of the number of gate signal lines -- it is because it can arrange every [2])). Therefore, it cannot be overemphasized that there is the feature that a frame becomes equivalent by the right and left of a screen.

[0285]This invention has the feature also in the scanning direction of the gate signal line 17, and a screen separation. For example, the gate driver 12a is connected with the gate signal line 17b of the upper part of a screen in drawing 28. The gate driver 12b is connected with the gate signal line 17a of the bottom of screen. As the arrow A also shows the scanning direction of the gate signal line 17, it is the direction of the upper part of a screen to the lower part. The source signal line 18 is common to the upper part of a screen, and a bottom of screen.

[0286]In drawing 29, it is connected so that the gate driver 12a may differ from the gate signal line 17 with which the upper part of a screen adjoined. The gate driver 12a is connected with odd-numbered gate signal line b. The gate driver 12b is connected with the even-numbered gate signal line 17a. The gate signal line 17b of the scanning direction of a gate signal line is the direction of the upper part of a screen to the lower part (arrow A). The gate signal line 17a is the direction of a bottom of screen to the upper part (arrow B). Thus, by connecting the gate signal line 17 with gate driver IC12, by making the scan method of a gate signal line into a predetermined direction, a luminosity inclination does not occur on Screen 21, but generating of a flicker can also be controlled again.

[0287]The source signal line 18 is common to the upper part of a screen, and a bottom of screen. However, it cannot be overemphasized that it may divide by the upper and lower sides of a screen. The above matter is applied to other examples.

[0288]The gate driver 12a is connected with the gate signal line 17b of the upper part of a screen in drawing 30. The gate driver 12b is connected with the gate signal line 17a of the bottom of screen. The scanning direction of the gate signal line 17b is the direction of the upper part of a screen to the lower part, as the arrow A shows. The scanning direction of the gate signal line 17a is the direction of the lower part of a screen to the upper part, as the arrow B shows. The source signal line 18 is common to the upper part of a screen, and a bottom of screen. Thus, by connecting the gate signal line 17 with gate driver IC12, by making the scan method of a gate signal line into a predetermined direction, a luminosity inclination does not occur on Screen 21, but generating of a flicker can also be controlled again.

[0289]In drawing 30, 1 chip making (1 chip driver IC14a) of source drivers IC 14 and gate driver IC12 is carried out. If 1 chip making is carried out, mounting of the IC chip to the display panel 82 can be managed with one piece. Therefore, implementation cost can also be reduced. The various voltage used within 1 chip driver IC can also be generated simultaneously. It cannot be overemphasized that 1 chip driver IC14a may be produced with semiconductor wafers, such as silicon, it may not limit to this although mounted in the display panel 82, and it may form in the display panel 82 directly by low-temperature-polysilicon art and elevated-temperature polysilicon technology. It cannot be overemphasized that the driver IC which drives the upper part of a screen may be arranged to the top chord of a display screen, and the driver IC which drives the lower part of a screen may be arranged to the lower side of a display screen (getting it blocked, mounting IC serves as two chips). The above matter is applied also to the example of other this inventions.

[0290]In drawing 28 and drawing 30, it expressed so that a screen might be divided in the center section, but it does not limit to this. For example, in the case of drawing 28, the display screen 21a may be made small, and it may enlarge the display screen 21b. Let the display screen 21a be a partialness viewing area (refer to Drawing 110). A partialness viewing area mainly performs a time stamp and a date display. A partialness viewing area is used in low-power-consumption mode. In drawing 28 and drawing 30, the viewing area 21a is displayed with the gate signal line 17b, and the viewing area 21b is displayed with the gate signal line 17a.

[0291]As illustrated in Drawing 111 in Drawing 110, it is good also as composition which considers the viewing area 21a as composition without three sides, and arranges the conventional source driver 14 and the gate driver 12 for the viewing area 21b the separate neighborhood. That is, the gate signal line 17a and the source signal line 18a are outputted from 1 chip driver IC14a.

[0292]The viewing area 21 may be divided into two fields, 21a and 21b, so that it may illustrate to Drawing 114, and the source drivers IC 14 corresponding to each field and the gate driver 12 may be arranged. Since the writing time of the video signal outputted from each source driver 14 in Drawing 114 doubles as compared with other examples, a signal can fully be written in a pixel. The viewing area 21 may be set to one and may arrange the one source drivers IC 14 each to the upper and lower sides of a screen so that it may illustrate to Drawing 113. This is applicable similarly to gate driver IC12.

[0293]Although it was the composition of the above example having formed the gate signal line 17 in parallel, and wiring to a picture element region, it cannot be overemphasized that the source signal line 18 may be constituted so that it may wire in

parallel with one side so that it may not limit to this and may illustrate to Drawing 112.

[0294]In Drawing 110, Drawing 111, Drawing 114, etc., it is also a means effective in low power consumption to change a frame rate (drive frequency or number of times of screen rewriting per unit time (for 1 second)) by the viewing areas 21a and 21b. It is also effective in low power consumption to change display color numbers or a foreground color by the viewing areas 21a and 21b.

[0295]The cathode of EL element 15 is connected to Vs1 potential with the composition illustrated by drawing 1. However, there is a problem that the driver voltages of the organic electroluminescence which constitutes each color differ. For example, when the current of 0.01 (A) per unit square centimeter is sent, in blue (B), the terminal voltage of an EL element is 5(V), but in green (G) and red (R), they are 9(V)s. That is, terminal voltage differs by B, G, and R. Therefore, in B, G, and R, the sauce drain voltage (SD voltage) of 11c11 d of transistors to hold differs. Therefore, the sauce drain voltage (SD voltage) OFF leakage current of a transistor will differ in each color. If OFF leakage current occurs and OFF leakage characteristics differ in each color, it will become about the complicated displaying condition which a flicker generates after color balance has shifted that correlate with the luminescent color and the gamma characteristic shifts.

[0296]In order to cope with this technical problem, it constitutes from this invention so that it may illustrate to drawing 5, and the potential of one cathode terminal may be changed with the potential of the cathode terminal of other colors among R, G, and B color at least. By drawing 5, B is used as the cathode terminal 53a, and, specifically, G and R are used as the cathode terminal 53b. Although drawing 5 assumes lower extraction which takes out light from a glass surface, there is also a case of upper extraction. In this case, a cathode and an anode may become the reversed composition.

[0297]It cannot be overemphasized that it is preferred to make it in agreement as much as possible as for the terminal voltage of EL element 15 of R, G, and B. At least, white peak luminosity is displayed, and in the or more 6000K9000K or less range, as for the terminal voltage of the EL element of R, G, and B, a color temperature needs to carry out material or structure selection so that it may become 10 or less (V). ** of R, G, and B — it is necessary to make the difference of the greatest terminal voltage of an EL element, and the minimum terminal voltage into less than 2.5 (V) among them It is necessary to make it 1.5 or less (V) still more preferably. In the above example, although the color was set to RGB, it is not limited to this. This is explained later.

[0298]Amendment of color unevenness is also required. This is generated by the variation in thickness, and the variation of the characteristic in order to distinguish the EL material of each color by different color with. performing a white raster display by 70% of luminosity 30%, in order to amend this — the field of each color in the viewing area 21 — internal division — cloth is measured. The distribution within a field is measured one point respectively to at least 30 pixels. This measurement data is saved on the table which consists of memories, and this saved data is used, and it constitutes so that inputted image data may be amended and it may display on the display screen 21.

[0299]Although a pixel is made into the three primary colors of R, G, and B, it may not be limited to this, and three colors of cyanogen, yellow, and magenta may be sufficient as it. Two colors of B and yellow may be sufficient. Of course, monochrome may be sufficient. Six colors of R, G, B, cyanogen, yellow, and magenta may be sufficient. Five colors of R, G, B, cyanogen, and magenta may be sufficient. A color reproduction range expands these as a natural color, and they can realize a good display. In addition, four colors of R, G, B, and white may be sufficient. Moreover seven colors of R, G, B, cyanogen, yellow, magenta, black, and white may be sufficient, the pixel of white light is formed in the viewing-area 21 whole (production), and it is good also as a three-primary-colors display at light filters, such as RGB. In this case, what is necessary is to laminate the luminescent material of each color to an EL layer, and just to form in it. 1 pixel may be distinguished by different color with like B and yellow. The EL display of this invention is not limited to what performs a colored presentation by the three primary colors of RGB as mentioned above.

[0300]There are mainly three methods in colorization of an organic electroluminescence display panel, and a convert-colors method is one of these. What is necessary is just to form the monolayer of a blue chisel as a luminous layer, and the remaining green and red required for full-color-izing are made by convert colors from blue glow. Therefore, there is an advantage which does not need to distinguish each class of RGB by different color with that it is not necessary to prepare the organic electroluminescence material of each color of RGB. A convert-colors method is distinguished by different color with, and it does not have ***** so that it may be a method. The EL panel of this invention is applied by any of this method.

[0301]The pixel 16W of white light other than the three primary colors may be formed so that it may illustrate to Drawing 168. The pixel 16W of white light is realizable by producing from that of laminating the structure of R, G, and B luminescence (formation or composition). 1 set of pixels consist of the three primary colors of RGB, and the pixels 16W of white light. It becomes easy to express white peak luminance by forming the pixel of white light. therefore, there is a feeling of brightness — image display realization can be carried out.

[0302]As for the area of the picture element electrode of each color, it is preferred to make it differ so that it may illustrate to Drawing 169, even if it is the three primary colors, such as RGB, a case where 1 set of pixels are carried out. Of course, balance of the luminous efficiency of each color may be good, and an identical area may be sufficient as long as balance also avoids color purity. However, if the balance of one or more colors is bad, it is preferred to adjust a picture element electrode (emission area). The electrode area of each color should just determine current density as a standard. That is, when a color temperature adjusts a white balance in the 9000K or less range more than 6000K (kelvin), it is made for the difference of the current density of each color to be less than **30%. It is made to become less than **15% still more preferably. For example, if current density carries out 100A / square meter, it will be made for each three primary colors to be less than a more than 70A/square meter 130A/square meter. It is made for each three primary colors to be less than a more than 85A/square meter 115A/square meter still more preferably.

[0303]It is preferred to arrange by the pixel row which adjoined so that trichromatic arrangement may differ so that it may illustrate to Drawing 170. For example, from the left, if the eventh line is arrangement of R, G, and B, it will consider the oddth line as arrangement of B, G, and R. By arranging in this way, the resolution of the oblique direction of a picture is improved also with a small pixel number. The 1st line may be considered as arrangement of R, G, B, R, G, and B from the left, the 2nd line may be considered as arrangement of G, B, R, G, B, and R, and pixel arrangement may be changed by three or more pixel rows so that the 3rd line may be considered as arrangement of B, R, G, B, R, and G.

[0304]The cathode terminal 53a is formed using the metal mask art which distinguished the organic electroluminescence of each color by different color with. A metal mask is used because organic electroluminescence cannot perform etching etc. in water weakly. Using a metal mask (not shown), the cathode terminal 53a is vapor-deposited and connection is taken simultaneously in the contact hole 52a. The B cathode wiring 51a and an electrical link can be taken by the contact hole 52a.

[0305]The cathode terminal 53b is similarly formed using the metal mask art which distinguished the organic electroluminescence of each color by different color with. Using a metal mask (not shown), the cathode terminal 53b is vapor-deposited and connection is taken simultaneously in the contact hole 52b. The RG cathode wiring 51b and an electrical link can be taken by the contact hole 52b. The aluminum film thickness of a cathode terminal is good to form so that it may be set to not less than 70 nm 200 nm or less.

[0306]Since different voltage can be impressed to the cathode terminals 51a and 51b by the above composition, even if the Vdd voltage of drawing 1 is common to each color, the voltage impressed to EL of at least 1 color among RGB can be changed. At drawing 5, although it is considered as the same cathode terminal 53b, it may not limit to this, and it may constitute from RG so that it may become a cathode terminal which differs by R and G.

[0307]By constituting as mentioned above, in each color, the OFF leakage current between the source drain voltage (SD voltage) of a transistor can occur, and a kink phenomenon can be prevented. Therefore, a flicker does not have generating, it does not correlate with the luminescent color, the gamma characteristic does not necessarily shift, and good image display can be realized.

[0308]It cannot be overemphasized that Vs1 of drawing 1 may be made into cathode voltage, it may not limit to this although it presupposes that this cathode voltage is made to differ in each color, and the anode voltage Vdd may be constituted so that it may differ in each color. For example, it is the composition which makes Vdd of the pixel of R voltage 8(V), makes G 6(V)s and makes B 10(V)s. As for such anode voltage and cathode voltage, it is preferred to constitute so that it can adjust in the range of ± 1 (V).

[0309]Even if panel size is about 2 inches, about 100-mA current is outputted from the anode connected with Vdd. Therefore, low-resistance-izing of the anode wiring 20 (current supply source line) is indispensable. In order to cope with this technical problem, by this invention, anode 63 wiring is supplied from wiring-area the upper part and the bottom so that it may illustrate by drawing 6 (both-ends electric supply). Generating of the luminosity inclination by the upper and lower sides of a screen is lost by carrying out both-ends electric supply as mentioned above.

[0310]In order to raise light emitting luminance, it is good to carry out surface roughening of the pixel 48. This composition is shown in drawing 7. First, the La Stampa art is used for the part which forms the picture element electrode 48, and detailed unevenness is formed in it. When a pixel is a reflection type, the metal thin film of about 200-nm aluminum is formed by sputtering process, and the picture element electrode 48 is formed. Surface roughening of the heights is provided and carried out to the part where the picture element electrode 48 touches organic electroluminescence. In the case of a simple matrix type display panel, the picture electrode 48 makes it the shape of a stripe like electrode. Heights may not be limited only to convex and a concave may be sufficient as them. Concave and a convex may be formed simultaneously.

[0311]The size of the projection was about 4 micrometers in diameter, set the average value of the distance between contiguity to 10 micrometers, 20 micrometers, and 40 micrometers, and performed the 120 measurement of luminance/mm for the unit area density of the projection from 1000 to 1200 pieces/square millimeter and 100 as 2 and 600 to 800 pieces/square millimeter, respectively. Then, it turned out that light emitting luminance becomes strong, so that the unit area density of the projection became large. Therefore, it turned out that the surface state of a picture element electrode is changed and light emitting luminance can be adjusted by changing the unit area density of the projection on the picture element electrode 48. According to examination, the result good in 800 or less pieces [100 or less //square millimeter]/square millimeter was able to be obtained for the unit area density of the projection.

[0312]Organic electroluminescence is a self-light emitting device. If the light by this luminescence enters into TFT as a switching element, a phot conductor phenomena (contest the phot) will occur. In contest a phot, the phenomenon whose leak (off-leak) in the time of OFF of switching elements, such as TFT, increases by optical pumping is said.

[0313]In order to cope with this technical problem, as shown in drawing 9, by this invention, the lower layer of the gate driver 12 (depending on the case, it is the source driver 14) and the lower layer light-shielding film 91 of the picture element transistor 11 are formed. The light-shielding film 91 is formed with metal thin films, such as chromium, and sets the thickness to not less than 50 nm 150 nm or less. If thick [when thickness is thin, shielding effects are scarce, and], unevenness will occur and patterning of TFT11A1 of the upper layer will become difficult.

[0314]The smoothing film 71a which consists of or more 20 an inorganic material of 100 nm or less is formed on the light-shielding film 91. One electrode of the storage capacitance 19 may be formed using the layer of this light-shielding film 91. In this case, as for the smooth film 71a, it is preferred to enlarge capacity value of structure storage capacitance thinly as much as possible. The light-shielding film 91 may be formed with aluminum, a silicon oxide film may be formed in the surface of the light-shielding film 91 using anodization art, and this silicon oxide film may be used as a dielectric film of the storage capacitance 19. On the smoothing film 71b, the picture element electrode of a high aperture (HA) structure is formed.

[0315]The driver circuit 12 should control not only a rear face but penetration of the light from the surface. It is because it malfunctions under the influence of contest a phot. Therefore, in this invention, when a cathode terminal is a metal membrane, a cathode terminal is formed also in the surfaces, such as the driver 12, and this electrode is used as a light-shielding film.

[0316]However, if a cathode terminal is formed on the driver 12, malfunction of the driver by the electric field from this cathode terminal or the electric interengagement of a cathode terminal and a driver circuit may occur. In order to cope with this technical problem, in this invention, at least one layer of organic electroluminescence films of two or more layers are preferably formed simultaneously with the organic electroluminescence film formation on a picture element electrode on the driver circuit 12 etc.

[0317]Fundamentally, since an organic electroluminescence film is an insulating material, between a cathode and a driver is isolated by forming an organic electroluminescence film on a driver. Therefore, the above-mentioned technical problem is cancelable.

[0318]If between the terminals of one or more TFT11 of a pixel, or TFT11 and a signal wire short-circuit, EL element 15 may

always serve as a luminescent spot to turn on. Since this luminescent spot is visually conspicuous, it is necessary to sunspot-ize it (astigmatism light). To a luminescent spot, the applicable pixel 16 is detected, the capacitor 19 is irradiated with a laser beam, and between the terminals of a capacitor is short-circuited. Therefore, since it becomes impossible to hold an electric charge to the capacitor 19, TFT11a can be made not to send current.

[0319]It corresponds to the position which irradiates with a laser beam. It is desirable to remove a cathode film. It is to prevent the terminal electrode and cathode film of the capacitor 19 from short-circuiting by laser radiation.

[0320]The structure illustrated to Drawing 175 is also illustrated. Drawing 175 shows the example of the lower extraction structure which takes out light from the glass substrate 49 side. Also in Drawing 175, the lower layer of the gate driver 12 (depending on the case, it is the source driver 14) and the lower layer light-shielding film of the picture element transistor 11 are formed. Forming a light-shielding film with metal thin films, such as chromium, the thickness shall be not less than 50 nm 150 nm or less. If thick [when thickness is thin, shielding effects are scarce, and], unevenness will occur and patterning of TFT11A1 of the upper layer will become difficult.

[0321]TFT11 and the driver circuit 12 (14) are formed on a light-shielding film. The driver circuit 12 (14) should control not only a rear face but penetration of the light from the surface. It is because it malfunctions under the influence of contest a phot. Therefore, in this invention, the cathode terminal 46 is used as a light-shielding film.

[0322]However, if a cathode terminal is formed on the driver 12 (14), malfunction of the driver by the electric field from this cathode terminal or the electric interengagement of a cathode terminal and a driver circuit may occur. In order to cope with this technical problem, in this invention, at least one layer of organic electroluminescence films of two or more layers are preferably formed simultaneously with the organic electroluminescence film formation on a picture element electrode on the driver circuit 12 etc.

[0323]Structure of Mitsukami extraction which considers a picture element electrode as a reflective type, and uses a common electrode as transparent electrodes (ITO, IZO, etc.) on the other hand when a cathode (or anode) electrode is a transparent electrode (taking out light from the glass substrate 49 side takes out lower, and) When upper extraction takes out light from EL film vacuum evaporation side, the sheet resistance values of a transparent electrode pose a problem. Although a transparent electrode is high resistance, it is necessary to send current through the cathode of organic electroluminescence with high current density. If it carries out and backlash forms a cathode terminal by the monolayer of an ITO film, it will be in a heated state by generation of heat, or the luminosity inclination of a degree occurs very much in a display screen.

[0324]In order to cope with this technical problem, the low resistance-ized wiring 92 which consists of a metal thin film on the surface of a cathode terminal is formed. The low resistance-ized wiring 92 is the same composition (it is thickness (50 nm - 200 nm) at chromium or the charge of an aluminum material) as the black matrix (BM) of a liquid crystal display panel, and it is the same position (between picture element electrodes, on the driver 12, etc.). However, in organic electroluminescence, since it is not necessary to form BM, functions completely differ. The low resistance-ized wiring 92 may not be limited to the surface of the transparent electrode 72, and may be formed in a rear face (field which touches an organic electroluminescence film). Aluminum and magnesium, such as an alloy or laminated structure bodies, such as Mg-Ag, Mg-Li, and aluminum-Li, indium, copper, or each alloy may be used as a metal membrane formed in the shape of BM. In order to prevent corrosion etc. on BM, ITO and an IZO film are laminated further and organic thin films, such as inorganic thin films, such as SiNx and SiO₂, or polyimide, are formed.

[0325]As for the case in the case (upper extraction) of taking out light from the vacuum evaporation side of EL film, it is preferred to form Mg-Al film on the organic electroluminescence film 47, and to form ITO and an IZO film on it. It is preferred to form Mg-Al film on the organic electroluminescence film 47, and to form a black matrix (a black matrix like a liquid crystal display panel) on it. As for this black matrix, it is preferred to form by chromium, aluminum, Ag, Au, Cu, etc., and to form on this the protective film which consists of organic compound insulators, such as inorganic insulating films, such as SiO₂ and SiNx, polyester, and an acrylic. An antireflection film (AIR coat) is formed on this protective film.

[0326]An AIR coat has the composition of three layers, or two-layer composition. In the case of 3 lamination, optical thickness laminates $nd_1 = \lambda/2$, and magnesium fluoride (MgF₂) $nd_1 = \lambda/4$, and forms an aluminum oxide (aluminum₂O₃) for $nd = \lambda/4$, and a zirconium (ZrO₂). Usually, a thin film is formed as a value of 520 nm or the neighborhood of those as λ .

[0327]In two-layer composition, $nd_1 = \lambda/4$ or yttrium oxide (Y₂O₃), and magnesium fluoride (MgF₂) are laminated $nd_1 = \lambda/4$, and it forms silicon monoxide (SiO) for optical thickness $nd_1 = \lambda/4$, and magnesium fluoride (MgF₂).

[0328]In the case of one layer, magnesium fluoride (MgF₂) is laminated $nd_1 = \lambda/2$, and it forms it.

[0329]Even if it is a case of lower extraction, it is effective to make high transmissivity of the metal membrane of the cathode terminal 46. Even if it is the composition of seeing a display image from the substrate 49 side, it is because it is high, so a reflect lump decreases the transmissivity of the metal membrane 46. If a reflect lump decreases, the circular light board 74 will become unnecessary. Therefore, optical extraction efficiency may improve rather than upper extraction. As for the transmissivity of the metal membrane 46, it is preferred to make it to 90% or less not less than 60%. It is preferred to make it to not less than 70% of especially 90% or less. The sheet resistance values of a cathode terminal become it low that it is 60% or less. However, a reflect lump becomes large. Conversely, at not less than 90%, the sheet resistance values of a cathode terminal become high. Therefore, the luminosity inclination of a display image becomes large.

[0330]For making transmissivity of the metal membrane 46 high, an Al film is formed thinly. Thickness is formed in not less than 20 nm 100 nm or less. It is preferred to form ITO and an IZO film on it. It is preferred to form a black matrix on Al film 46. As for this black matrix, it is preferred to form by chromium, aluminum, Ag, Au, Cu, etc., and to form on this the protective film 1761 which consists of organic compound insulators, such as inorganic insulating films, such as SiO₂ and SiNx, polyester, and an acrylic. It is preferred to form an antireflection film (AIR coat) on this protective film 1761.

[0331]The emission area of the EL film 47 becomes large by making the picture element electrode 48 circular so that it may illustrate to Drawing 176. Therefore, current density becomes small and high lifetime-ization of EL element 47 can be realized. Since the terminal voltage of EL element 15 also falls, power efficiency also improves.

[0332]In Drawing 176, the smoothing film 71 is formed circularly and the contact hole which takes the drain terminal of TFT11 and contact on this circular smoothing film is formed. The transparent electrode 48 and drain terminal which consist of ITO(s) in

this contact hole are electrically connected.

[0333]Not less than 50-nm a carbon film of 150 nm or less is thinly vapor-deposited on the picture element electrode 48, and the EL film 47 is formed on this. In a monochromatic case, in the case of RGB, the EL film 47 uses a metal mask for the whole surface, and is distinguished by different color with on it (refer to Drawing 177 (f)).

[0334]Al film 46 used as a cathode terminal is formed after formation of the EL film 47 (Drawing 177 (g)). The protective film 1761 is formed on Al film 46 (Drawing 177 (h)).

[0335]The EL film 47 or the picture element electrode 48 may not be limited circularly, and triangular pyramid shape, conical shape, and the shape of a sine curve may have as it, and the structure which combined these may be sufficient as it. It may be the composition that triangular pyramid shape, conical shape, and the shape of a sine curve should have been formed, these had combined enough on the circle detailed to 1 pixel, or random unevenness was formed. Although convex is circular and it is in Drawing 176, it is good even if a concave is circular. The above matter is the same also with the structure as which triangular pyramid shape, conical shape, and the shape of a sine curve may have and which combined these.

[0336]Drawing 177 is an explanatory view of the manufacturing method of the EL display panel explained with Drawing 176. As illustrated in Drawing 177 (a), TFT11, the gate driver circuit 12, etc. are formed on the array substrate 49.

[0337]Next, the smoothing film 71 which consists of organic materials, such as an acrylic resin, is applied on the substrate 49 so that it may illustrate to Drawing 177 (b). The smoothing films 71 may be inorganic materials, such as SOG. As for thickness, it is preferred to use not less than 1.5 micrometers 3 micrometers or less. Next, the mask 1771 is formed on said smoothing film 71.

The mask 1771 is formed with a metallic material and it is made for a formation position to correspond to the pixel 16. Next, it etches. Any of dry etching, such as wet etching and O₂ plasma, may be sufficient as etching. The smoothing film 71 is etched from between the masks 1771. Therefore, the smoothing film 71 becomes circular so that it may illustrate to Drawing 1771 (c).

[0338]A mask (not shown) is formed in the smoothing film 71, and the contact hole 1772 is formed so that it may illustrate to Drawing 177 (d). Or the contact hole 1772 is also simultaneously formed by the etching process of Drawing 177 (b).

[0339]Next, the picture element electrode 48 is formed with transparent electrodes, such as ITO and IZO, so that it may illustrate to Drawing 177 (e). The picture element electrode 48 and TFT11 take connection by the pixel contact part 1751. The transparent electrode 48 and drain terminal which consist of ITO(s) in this contact hole are electrically connected.

[0340]Not less than 50-nm a carbon film of 150 nm or less is thinly vapor-deposited on the picture element electrode 48, and the EL film 47 is formed on this. In a monochromatic case, in the case of RGB, the EL film 47 uses a metal mask for the whole surface, and is distinguished by different color with on it (refer to Drawing 177 (f)). Al film 46 used as a cathode terminal is formed after formation of the EL film 47 (Drawing 177 (g)). The protective film 1761 is formed on Al film 46 (Drawing 177 (h)).

[0341]For making transmissivity of the metal membrane 46 high, Al film 46 is formed thinly. Thickness is formed in not less than 20 nm 100 nm or less. It is preferred to form ITO and an IZO film on it. It is preferred to form a black matrix on Al film 46. As for this black matrix, it is preferred to form by chromium, aluminum, Ag, Au, Cu, etc., and to form on this the protective film 1761 which consists of organic compound insulators, such as inorganic insulating films, such as SiO₂ and SiN_x, polyester, and an acrylic. It is preferred to form an antireflection film (AIR coat) on this protective film 1761. The minimum thickness of the protective film 1761 shall be 1 micrometers or more.

[0342]The protective film 1761 may be the protective layer which used the film. For example, using for the film of an electrolytic condenser what vapor-deposited DLC (diamond-like carbon) as a protective layer is illustrated. This film has very bad moisture perviousness (moisture proof). This film is carried out protective layer 1761, and it uses.

[0343]The thickness of the protective layer 1761 is $n \cdot d$ (n calculates those refractive indices by making them synthesis ($n \cdot d$ of each thin film is calculated), when the refractive index of a thin film and two or more thin films are laminated.), d synthesizes and calculates those refractive indices, when the thickness of a thin film and two or more thin films are laminated. It is good to make it below the luminescence dominant wavelength λ of EL element 15 become.

[0344]Drawing 178 is a panel-sized lineblock diagram (sectional view). although other drawings are the same, in order that each drawing may draw an understanding easily in this specification -- an abbreviation -- or/and, scaling is carried out. Also in the sectional view of the display panel of Drawing 178, the smoothing film 71 etc. are illustrated thickly enough. However, board thickness is also illustrating the substrate 49 very thinly. TFT is omitting and illustrating.

[0345]In Drawing 178, the spacer 1781 is arranged between the sealing plate 41 and the substrate 49, and it is constituted so that the protective film 1761, the reflection film 46 or the EL film 47, and the sealing plate 41 may not touch directly. The periphery of the viewing area is arranged or filled up with the drier. A spacer uses a cylindrical thing or a spherical thing. As for height, it is preferred to use not less than 10 micrometers 100 micrometers or less. It can also be considered as a spacer by processing the protective film 1761. That is, the function of a spacer is given from that of processing or forming a part or all of the protective film 1761 in a protuberance form or pillar top or stripe shape. The composition which uses the spacer 1781 as a drier is also preferred.

[0346]TFT11b and TFT11a of the pixel shown in drawing 21 are the relations of a current mirror. The characteristics (the threshold V_t , S value, mobility μ , etc.) of 11b and 11a of the relation of this current mirror must be in agreement. In the pixel of drawing 1, it cannot be overemphasized that it is preferred that the characteristic of each TFT is in agreement.

[0347]As for the semiconductor membrane which constitutes TFT11 of the pixel 16, in low-temperature-polysilicon art, forming by laser annealing is common. The variation in the conditions of this laser annealing turns into variation in the TFT11 characteristic. However, by the method which performs current programming, such as drawing 1, drawing 21, drawing 22, drawing 43, and drawing 71, if the characteristic of TFT11 in 1-pixel 16 is in agreement, it can drive so that predetermined current may flow into EL element 15. This point is an advantage which is not in a voltage program.

[0348]To this technical problem, by this invention, as shown in drawing 23, it irradiates with the laser radiation spot 23 at the time of annealing in parallel with the source signal line 18. The laser radiation spot 23 is moved so that it may be in agreement with one pixel row. Of course, for example, it may irradiate with laser not in the thing to limit to one pixel row but in the unit [RGB / 1 pixel] of drawing 23 16 (in this case, it will be called three pixel rows).

[0349]Especially the pixel is produced so that it may become square shape at 3 pixels of RGB. Therefore, each pixel of R, G, and B serves as longwise picture element shape. Therefore, arrangement of TFT11 formed in the pixel 16 is arranged in a lengthwise direction so that it may illustrate to drawing 23 (TFT11a, 11b). Therefore, the characteristic variation of TFT11 can be prevented

from generating within 1 pixel by making the laser radiation spot 23 longwise and annealing it.

[0350]Generally the length of the laser radiation spot 23 is a fixed value like 10 inches. Since this laser radiation spot 23 is moved, it is necessary to arrange a panel so that it may fall within the range which can move the one laser radiation spot 23 (it is got blocked, and are and it carries out so that the laser radiation spot 23 may not lap in the center section of the viewing area 21 of a panel).

[0351]In the composition of drawing 24, it is formed so that three panels may be perpendicularly arranged within the limits of the length of the laser radiation spot 23. The annealer which irradiates with the laser radiation spot 23 recognizes the positioning marker 242a of the glass substrate 241, and 24ab, and moves the laser radiation spot 23. A pattern recognition device performs recognition of the positioning marker 242. An annealer (not shown) recognizes the positioning marker 242 and deduces the position of a pixel row. And exactly, it irradiates with the laser radiation spot 23, and annealing is performed one by one so that it may lap with a pixel row position.

[0352]As for especially the laser annealing method (method which irradiates with the laser spot of line form in parallel with the source signal line 18) explained by drawing 23 and drawing 24, it is preferred to adopt at the time of the current programming method of an organic EL panel. Because, it is because the characteristic of TFT11 is in agreement in a source signal line in parallel (the characteristic of the pixel TFT which adjoined the lengthwise direction approximates). Therefore, there is little change of the voltage level of a source signal line at the time of a current drive, and it is hard to generate current writing shortage (for example, if it is a white raster display, since the current sent through TFT11a of each pixel which adjoined is almost the same, there is little change of the current amplitude outputted from the source drivers IC 14).

[0353]Homogeneity can realize image display (it is because it is hard to generate the display unevenness which originates mainly in dispersion in a TFT characteristic) by the method which carries out the simultaneous writing of two or more pixel rows explained by drawing 87, drawing 88, etc. Since drawing 87 is chosen as two or more pixel line coincidence, if TFT of the pixel which adjoined is uniform, the TFT characteristic nonuniformity of a lengthwise direction is absorbable in the driver circuit 14.

[0354]As shown in drawing 1, the gate signal line 17a will be in switch-on (since the transistor 11 of drawing 1 is a p channel transistor here, it is flowed with a low level) at a line selection period, and makes the gate signal line 17b switch-on at the time of a non selection period.

[0355]If the parasitic capacitance of the source signal line 18 increases as it is shown in drawing 55 (a), when the state of a source signal line is gradation 0 displaying condition, the current value over the gradation 1 is impressed and a line selection period is operated in 75 microseconds, the current value outputted to EL element 15 will decrease.

[0356]Drawing 55 (b) is a case where the current value over the gradation 1 is passed 10 times compared with (a), and the decrease proportion of the current value outputted to EL element 15 to the increase in the parasitic capacitance of the source signal line 18 becomes small.

[0357]Since about 10% of dispersion cannot be observed as a difference of luminosity for human being's eyes to a fixed current value, the sauce capacity permitted supposing it accepts about 10% of fall is 2 pF or less in (a), and is 25 pF or less in (b).

[0358]Since the time t which current value change of the source signal line 18 takes is $t=C \cdot V/I$ when the current which flows the size of stray capacitance through the voltage of C and a source signal line into V and a source signal line is set to I , that a current value can be enlarged 10 times can do short time which current value change takes to about 1/10. Or even if sauce capacity increases 10 times, it is shown that it can change to a predetermined current value. Therefore, in order to write in a predetermined current value within a short horizontal scanning period, it is effective to make a current value increase.

[0359]Since output current will also become increasing an input current 10 times with 10 times and the luminosity of EL will be 10 times, in order to obtain predetermined luminosity, a transistor [of drawing 1 / 17d] "on" period is set to 1/10 over the past, and predetermined luminosity was displayed by setting a light emission period to 1/10.

[0360]That is, in order to fully perform the charge and discharge of the parasitic capacitance of the source signal line 18 and to perform a program for a predetermined current value to TFT11a of the pixel 16, it is necessary to output comparatively big current from the source driver 14. However, if big current in this way is sent through the source signal line 18, this current value will be programmed by the pixel, and big current flows into EL element 15 to predetermined current. For example, if it programs with 10 times as much current, naturally, 10 times as much current will flow into EL element 15, and EL element 15 will emit light by one 10 times the luminosity of this. What is necessary is just to make time to flow into EL element 15 into 1/10, in order to use predetermined light emitting luminance. By driving in this way, the charge and discharge of the parasitic capacitance of the source signal line 18 can fully be carried out, and predetermined light emitting luminance can be obtained.

[0361]This is an example, although one 10 times the current value of this is written in TFT11a (the terminal voltage of the capacitor 19 is set up correctly) of a pixel and ON time of EL element 15 is made into 1/10. Depending on the case, one 10 times the current value of this is written in TFT11a of a pixel, and it is good as for 1/5 in the ON time of EL element 15. Conversely, one 10 times the current value of this may be written in TFT11a of a pixel, and the ON time of EL element 15 may be doubled. This invention making the write current to a pixel values other than a predetermined value, making into an intermittent condition the current which flows into EL element 15, and driving has the feature. In this specification, in order to explain easily, one N times the current value of this is written in TFT11 of a pixel, and it explains increasing the ON time of EL element 15 $1/N$ time. However, not the thing to limit to this but an $N1$ time current value is written in TFT11 of a pixel, and it cannot be overemphasized that $1/N$ twice (it differs in $N1$ and $N2$) may be sufficient in the ON time of EL element 15. The interval which carries out an intermission is not limited at equal intervals. For example, it may be random (a display period or a non-display period should just serve as a predetermined value (fixed rate) as a whole). It may differ by RGB. That is, what is necessary is just to adjust so that white (white) balance may become the optimal, and R, G, a B display period, or a non-display period may serve as a predetermined value (fixed rate) (setting out).

[0362]In order to explain easily, $1/N$ is explained setting these 1F to $1/N$ on the basis of 1F (1 field or one frame). However, one pixel row is chosen, and there is time (usually one horizontal scanning period (1H)) when a current value is programmed, and an error is also produced depending on a scanning state. Therefore, the above explanation is only a problem of the shape of facilities for explaining easily to the last, and is not limited to this.

[0363]An organic (inorganic matter) EL display has a technical problem also in the point that the method of presentation differs from the display which displays a picture as a set of a line display with an electron gun like CRT fundamentally. That is, in an EL

display, the current (voltage) written in the pixel is held between the periods of 1F (1 field or one frame). Therefore, animation display will generate the technical problem that outline dotage of a display image occurs.

[0364]In this invention, during the period of 1 F/N **** current to EL element 15, and other periods (1F(N-1) /N) do not send current. The case where carried out this drive system and one point of a screen is observed is considered. In this displaying condition, an image data display and a black display (astigmatism light) are repeatedly displayed for everyF. That is, an image data displaying condition will be in a discontinuous display (intermittent display) state in time. If a video data display is seen by this intermittent displaying condition, outline dotage of a picture is lost and a good displaying condition can be realized. That is, animation display near CRT is realizable. Although an intermittent display is realized, the main clocks of a circuit are not different from the former. Therefore, the power consumption of a circuit does not increase.

[0365]The image data (voltage) which light modulation is made in the case of a liquid crystal display panel is held at a liquid crystal layer. Therefore, if it is going to carry out a black insertion display, it is necessary to rewrite the data currently impressed to a liquid crystal layer. Therefore, it is necessary to make high the operation clock of the source drivers IC 14, and to impress a black indicative data to the source signal line 18 for image data by turns. Therefore, if black insertion (intermittent display of a black display etc.) is made into realization *****, it is necessary to raise the main clocks of a circuit. The image memory for carrying out time-axis extension is also needed.

[0366]In the pixel configuration of the EL display panel of this invention shown in drawing 78 etc. from drawing 1, drawing 43, drawing 44, drawing 53, drawing 54, and drawing 67, image data is held at the capacitor 19. The current corresponding to the terminal voltage of this capacitor 19 is sent through EL element 15. Therefore, image data is not held like a liquid crystal display panel at a light modulation layer.

[0367]This invention controls the current sent through EL element 15 only by making TFT11d of switching, or TFT11e turn on and off. That is, even if it turns off the current Iw which flows into EL element 15, as for image data, the capacitor 19 is held as it is. Therefore, if the switching element 11d etc. are made one [the following timing] and current is sent through EL element 15, the flowing current is the same as that of the current value which was flowing before. If black insertion (intermittent display of a black display etc.) is made into realization *****, it is not necessary to raise the main clocks of a circuit with this invention in the case. The image memory for not carrying out time-axis extension is also unnecessary. Time after impressing current until it emits light is short, and the organic EL device 15 is a high speed response. Therefore, it is suitable for animation display and the problem of the animation display which is a problem of conventional data-hold type display panels (a liquid crystal display panel, an EL panel, etc.) can be solved from that of carrying out an intermittent display further.

[0368]For example, as shown in drawing 33, as for the gate signal line 17b, an "on" period is 1F (since program time is usually 1H and the number of pixel rows of an EL display is at least 100 or more lines when current programming time is set to 0) conventionally. If it supposes that an error is 1% or less also as 1F and is referred to as N= 10, according to drawing 55, if sauce capacity is about 20 pF, it can change from the gradation 0 which starts change most as for time also to the gradation 1 in about 75 microseconds. If this is an EL display about 2 type, it shows that frame frequency can drive at 60 Hz.

[0369]What is necessary is just to make source current into 10 or more times, when sauce capacity becomes large with a large-sized display. What is necessary is just to make the "on" period of the gate signal line 17b (TFT11d) into 1 F/N, when a source current value is generally increased N times. Thereby, it is applicable to television, the display for a monitor, etc.

[0370]Hereafter, it explains in more detail, referring to drawings. First, the parasitic capacitance 404 of drawing 1 is generated with the connection capacity between source signal lines, the buffer output capacity of drive IC14, the cross capacity of the gate signal line 17 and the source signal line 18, etc. This capacity 404 is usually set to not less than 10 pF. In a voltage drive, since voltage is impressed to the source signal line 18 by low impedance, parasitic capacitance does not become large from driver IV14 with a problem by drive somewhat.

[0371]However, it is necessary to program the capacitor 19 of a pixel according to the micro current of 5 or less nA at the image display of a black level especially in a current drive. Therefore, if the parasitic capacitance 404 occurs in the size beyond a predetermined value, the charge and discharge of the parasitic capacitance cannot be carried out within time (since less than [1H], however two pixel rows may be written in simultaneously, not usually limited to less than [1H].) to program to one pixel row. If charge and discharge become impossible in 1H period, it will become the writing shortage to a pixel and resolution will not come out at all.

[0372]In the case of the pixel configuration of drawing 1, as shown in drawing 13 (a), the program current I1 flows into the source signal line 18 at the time of current programming. This current I1 flows through TFT11a, and the 19 capacitorV1 is set up so that the current which passes I1 may be held (program). At this time, TFT11d is an open condition (OFF state).

[0373]Next, TFT11 operates like drawing 13 (b) in the period which sends current through EL element 15. That is, OFF state voltage (Vgh) is impressed to the gate signal line 17a, and TFT11a and 11c turn off. On the other hand, one [ON state voltage (Vgl) is impressed to the gate signal line 17b, and / TFT11d].

[0374]Now, supposing the current I1 is N times the current (predetermined value) originally sent, the current which flows into EL element 15 of drawing 13 (b) will also be set to I1. Therefore, EL element 15 emits light by one 10 times the luminosity of a predetermined value.

[0375]Then, if only the period of 1/N of time (about 1F) originally is made one and other period (N-1) / N periods are made to turn off, the average luminance of the 1F whole will turn into predetermined luminosity. [TFT11d] This displaying condition is approximated with CRT scanning the screen with the electron gun. The range as which a different point displays the picture is the point which 1/N (the full screen is set to 1) of the whole screen has turned on (the range turned on in CRT is one pixel row (it is 1 pixel strictly)).

[0376]In this invention, as the image display region of this 1/N shows drawing 31 (a1), it moves downward from on Screen 21. In this invention, current flows into EL element 15 only between the periods of 1 F/N, and other periods (1F-(N-1)/N) do not flow through current. Therefore, a picture serves as an intermittent display. However, since it will be in the state where the picture was held by the afterimage to human being's eyes, it seems that the full screen is displayed uniformly.

[0377]In this displaying condition, an image data display and a black display (astigmatism light) are repeatedly displayed for everyF. That is, an image data displaying condition will be in a discontinuous display (intermittent display) state in time. In the liquid crystal display panel (EL display panels other than this invention), since data was held during 1F at the pixel, when it was

animation display, even if image data changed, the change could not be followed, but it had become an animation Japanese quince (outline Japanese quince of a picture). However, in this invention, since the picture is indicated by intermittent, outline dotage of a picture is lost and a good displaying condition can be realized. That is, animation display near CRT is realizable.

[0378] There is also no contrast drop like [at the time of indicating the liquid crystal display panel by intermittent in an EL display, since the black display was completely astigmatism light]. An intermittent display is realizable only by carrying out on-off operation of the TFT11d, as shown in drawing 13. This is because the memory (a gradation number is infinite since it is an analog value) of the image data is carried out to the capacitor 19. That is, image data is held during 1F at each pixel 16. Control of TFT11d has realized whether the current equivalent to this image data currently held is sent through EL element 15.

[0379] It is important to maintain the terminal voltage of the capacitor 19. It is because flicker (flicker etc.) will occur when screen intensity changes and a frame rate falls if the terminal voltage of the capacitor 19 changes in 1 field (frame) period (charge and discharge). It is necessary to make it the current which TFT11a sends through EL element 15 in an one-frame (1 field) period not fall to at least 65% or less. In these 65%, it is that the current sent through EL element 15 when it writes in the pixel 16, and the beginning of the current sent through EL element 15 considers it as 100%, just before writing in said pixel 16 with the following frame (field) considers it as not less than 65%.

[0380] Therefore, it is changeless to the number of TFT11 which constitutes 1 pixel from a case where it is not considered as the case where an intermittent display is realized. That is, the pixel configuration remained as it was, was removed with the influence of the parasitic capacitance 404 of the source signal line 18, and has realized good current programming. Moreover, animation display near CRT is realized.

[0381] As for the operation clock of the gate driver circuit 12, since it is late enough as compared with the operation clock of the source driver circuit 14, the main clocks of a circuit do not necessarily become high. Change of the value of N is also easy.

[0382] An image display direction (the direction of image writing) is made down from on a screen by 1 field eye (Drawing 104 (a)), and is good also as above (Drawing 104 (b)) from under a screen by the following 2nd field eye so that it may illustrate to Drawing 104. That is, Drawing 104 (a) and Drawing 104 (b) are repeated by turns.

[0383] Once considering it as down from on a screen by 1 field eye (Drawing 105 (a)) and considering the full screen as the black display (non-display) 312 so that it may illustrate to Drawing 105 (Drawing 105 (b)), by the following 2nd field eye, it is good also as above (Drawing 105 (c)) from under a screen. It is once good also considering the full screen as the black display (non-display) 312 (Drawing 105 (d)). That is, the state of Drawing 105 (a) to Drawing 105 (d) is repeated by turns.

[0384] In Drawing 104, Drawing 105, etc., although how to write in a screen was carried out the bottom or the bottom to the top from on the screen, it does not limit to this. Continuously, it fixes the bottom or the bottom to a top from on a screen, the write-in direction of a screen makes down the operation direction of the non display regions 312 from on a screen by 1 field eye, and it is good also as above from under a screen by the following 2nd field eye. The above matter is the same also in the example of other this inventions.

[0385] Drawing 31 (a) sets the image display region 311 to $1/N$, and is setting the non display regions (an astigmatism light field, a black display area) 312 to $(N-1)/N$ (however, this is a case of an ideal state.). Since there are the capacitor 19 and a thrust omission by the source gate (SG) capacity of TFT11a actually, it differs. That is, it is a case where the image display region 311 is set to one. The image display region 311 is moved to down from on a screen, as shown in an arrow (drawing 31 (a1) → drawing 31 (a2) → drawing 31 (a3) → drawing 31 (a1) →). However, though movement of this image display region 311 is not limited to moving to down from on a screen and moves to above from under a screen, it is good. It cannot be overemphasized that it may scan so that the 1st (1 field eye) frame may be moved to down from on a screen and the following frame [2nd (2 field eye)] may move to above from under a screen (operation). It may scan from the right of a screen from the left or the left of a screen to the right (operation).

[0386] Drawing 33 is an operation timing waveform. As indicated also in advance, it supposes that one screen is displayed in the period of 1F, and it is supposed that current programming will be carried out in the period of 1H. Drawing 33 (a) shows the timing waveform of the gate signal line 17a in drawing 1 (a) and (b). Drawing 33 (b) shows the timing waveform of the gate signal line 17b. When the gate signal line 17b is fundamentally set to Vgl, TFT11d flows (a period is one F/N), in peak current, N times as much current as the predetermined value I1 flows into EL element 15, and an EL element emits light by the luminosity B (N-B) N times the luminosity of predetermined. TFT11d will be in an OFF state during $1F/(N-1)/N$.

[0387] Control of this gate signal line is easily realizable by controlling two shift registers (22a, 22b) in the gate driver 12 like drawing 2. It is because the shift register 22a holds the control data of the gate signal line 17a (scan) and the shift register 22b should just hold the control data of the gate signal line 17b (scan).

[0388] Drawing 56 shows the waveform of the gate signal line 17b. When drawing 56 (a) is made into the voltage waveform of the gate signal line 17b of the 1st pixel row eye, the voltage waveform of the gate signal line 17b of the 2nd pixel row eye which adjoined the 1st pixel row eye in drawing 56 (b) is shown. Similarly, drawing 56 (c) shows the voltage waveform of the gate signal line 17b of the following 3rd pixel row eye, and drawing 56 (d) shows the voltage waveform of the gate signal line 17b of the 4th pixel row eye.

[0389] As mentioned above, by each pixel row, make the same the waveform of the gate signal line 17b, and it is made to shift at the interval of 1H, and impresses. The pixel row to turn on can be shifted one by one, specifying the time which EL element 15 has turned on by scanning in this way to $1F/N$. Thus, it is easy to realize to make the same the waveform of the gate signal line 17b, and to shift it by each pixel row. It is because what is necessary is just to control ST1 and ST2 which are data impressed to the shift registers 22a and 22b of drawing 2. For example, if Vgl is outputted to the gate signal line 17b when input ST2 is L level, and Vgh is outputted to the gate signal line 17b when input ST2 is H level, only the period of one F/N inputs ST2 impressed to the shift register 17b on L level, and other periods are used as H level. This ST2 inputted is only shifted by clock CLK2 in sync with 1H.

[0390] Creation of the waveform of the gate signal line 17a similarly shown in drawing 33 (a) is also easy. It is because what is necessary is just to control ST1 which is input data of the shift register 22a of drawing 2. For example, if Vgl is outputted to the gate signal line 17a when input ST1 is L level, and Vgh is outputted to the gate signal line 17a when input ST1 is H level, only the period of 1H inputs ST1 impressed to the shift register 17a on L level, and other periods are used as H level. This ST1 inputted is only shifted by clock CLK1 in sync with 1H.

[0391]It is the example which drawing 31 (b) made the image display region 311 1/(2N), and moved the two image display regions 311a and 311b to down from on the screen as shown in an arrow (drawing 31 (b1) → drawing 31 (b2) → drawing 31 (b3) → drawing 31 (b1) →). However, though movement of these image display regions 311a and 311b is not limited to moving to down from on the screen of a screen and moves to above from under a screen, it is good. It cannot be overemphasized that it may scan so that the 1st (1 field eye) frame may be moved to down from on a screen and the following frame [2nd (2 field eye)] may move to above from under a screen (operation). It may scan from the right of a screen from the left or the left of a screen to the right (operation). This image display region 311a may be moved to down from on a screen, and the image display region 311b may be moved to above from under a screen.

[0392]It is the example which drawing 31 (c) made the image display region 311 1/(3N), and moved the three image display regions 311a and 311b to down from on the screen as shown in an arrow (drawing 31 (c1) → drawing 31 (c2) → drawing 31 (c3) → drawing 31 (c1) →).

[0393]As shown in drawing 31 (b) and (c), the more it divides the image display region 311 into plurality, the more the frame rate (a screen is rewritten in the number of times 60 which writes a screen in 1 second, for example, a frame rate, 60 times in 1 second) of the whole image display can be reduced. If a frame rate is reduced, since the operation clock of the part and a circuit can be reduced, power consumption can be made small.

[0394]That is, the light emission period of EL element 15 becomes short, and the instant luminosity on appearance becomes high, and, moreover, in the image display region 311 and the astigmatism light field 312, for a ***** food ***** reason, a flicker decreases at high speed. Therefore, a frame rate can be reduced.

[0395]The number of times turned on in one frame (1 field) as mentioned above can be increased, and a flicker can be reduced. Since a frequency component becomes high in lighting of an EL element by increasing the number of times of lighting, human being's eyes become is hard to be observed. For example, when the lighting period per time is set to 1/7 and one frame was switched on 7 times, the display as for which frame frequency does not have a flicker in 30 Hz has been realized.

[0396]The luminosity of a picture can be adjusted by controlling turning on and off of TFT11d (variable). For example, in the case of drawing 31 (a), the luminosity of Screen 21 changes by changing the area of the astigmatism light field 312 (when the number of the image display regions 311 is one) (drawing 32 (a2) is darker than drawing 32 (a1), and drawing 32 (a3) is darker than drawing 32 (a2)).

[0397]Similarly, in the case of drawing 31 (b), drawing 32 (b2) is darker than drawing 32 (b1) (when the number of the image display regions 311 is two), and, in drawing 32 (b3), the display luminance of Screen 21 becomes dark from drawing 32 (b2). The same may be said of the case (when the number of the image display regions 311 is three, it is got blocked, and it is three or more) of drawing 31 (c) (drawing 32 (c2) is darker than drawing 32 (c1), and drawing 32 (c3) becomes dark from drawing 32 (c2)).

[0398]Although it presupposed that the image display region 311 scans the Screen 21 top in drawing 31, An one-frame (1 field) eye changes the full screen into the astigmatism light state 312, and the following two-frame (2 field) eye is good also considering the full screen as the image display state 311 so that it may illustrate not to the thing to limit to this but to drawing 32 (c1) (c2). That is, an image display state and an astigmatism light state are repeated for the full screen by turns. However, image display time and astigmatism light time are not limited to isochronous. For example, image display time is set to 1F/4, and it is good also considering astigmatism light time as 3F/4. Thus, the display luminance of a picture can be changed also by changing the rate of image display time and astigmatism light time (adjustment).

[0399]Anyway, as shown in drawing 34, the display luminance B of a picture can be linearly changed by changing the value of N. The luminosity of a picture is easily changed only by controlling the value of N.

[0400]Drawing 35 is a block diagram of the circuit which adjusts the display luminance of this invention (control). The picture image data inputted from the outside is accumulated in the frame memory (field memory) 354. CPU353 calculates using the accumulated picture image data. An operation uses at least one or more of the maximum luminance of picture image data, optimal brightness, average luminance, and luminance distribution. The maximum luminance of each frame of continuous picture image data, optimal brightness, average luminance, luminance distribution, and its changing ratio are also taken into consideration.

[0401]The calculated result is stored in the luminance memory 352. The luminance memory 352 is the data which amended the luminosity of the picture. For example, on bright screens, such as the seashore, when the average luminance of a picture is amended brightly and there is a comparatively dark portion within the image data, it changes into image data actually darker than a value. In the screen of night, since it is dark on the whole, a picture amends a comparatively bright portion more brightly.

[0402]It is a circuit which counts how much the counter circuit 351 makes N-ary of drawing 34. In the waveform of the gate signal line 17b, N-ary is changed in real time. Since N-ary is time, by counting at a counter, it can be changed easily and can change the luminosity of a picture.

[0403]The switching circuit 355 is a circuit which changes the voltage Vgl which makes TFT11 of the pixel 16 one, and the voltage Vgh (it is the reverse by N channel when pixel TFT11 is P channel) made to turn off. That is, based on the output of the counter circuit 351, the period of 1 F/N shown in drawing 33 (b) is changed. Therefore, the luminosity of the picture 21 can be easily changed in real time.

[0404]According to video signal data, display luminance is controlled in real time. The dynamic range of luminosity expression is expandable to 3 or more times on parenchyma by controlling in this way. Since an EL display serves as a black display (astigmatism light) thoroughly when not sending current through EL, the black float of image display does not generate it, either. That is, contrast also becomes high. Especially in the case of current programming, to a black display, the current value programmed to a pixel is as small as 10nA. Therefore, it is difficult to be unable to carry out the charge and discharge of the parasitic capacitance 404 enough, but to realize a perfect black display. Electric power is supplied to the source signal line 18 by the pulse impressed to the gate signal line 17 (running voltage), and it is generated by the black float.

[0405]It suspends that this invention turns OFF TFT11d compulsorily, and supplies current to EL element 15. Therefore, EL element 15 will be in an astigmatism light state thoroughly. Therefore, good contrast is realizable. It is necessary to adjust the output timing of the data impressed to the source signal line 18, and the timing of the gate signal lines 17a and 17b. As for especially the output of Vgl (voltage which makes one TFT11b of drawing 1, and 11c) of the gate signal line 17a which chooses a

pixel row, it is preferred to make it become shorter than 1H. Drawing 252 also explains this.

[0406]In drawing 35, based on the picture image data of a video signal although the luminosity of a picture is changed in real time, it does not limit to this. For example, a user's pushing a lightness adjustment switch or a brightness adjusting volume is turned. This change may be detected, the counter value of the counter circuit 351 may be changed, and the luminosity (or contrast or a dynamic range) of the display image 21 may be changed. Photosensor may detect luminosities, such as outdoor daylight, and the luminosity of the display image 21, etc. may be automatically changed based on this detected data. It may constitute so that it may be manual or may be made to change with the contents of the picture to display, and data automatically.

[0407]Lightness adjustment is realizable by making TFT (drawing 1 TFT11d) by the side of EL element 15 turn on and off. In this case, the program current (voltage: in the case of a voltage program method) outputted from source drive IC14 is a fixed value (program current is not changed). Therefore, the circuitry of a source drivers IC can be simplified. That is, it is not necessary to change output current (voltage) etc. corresponding to the luminosity of a display screen. for example, — the conventional liquid crystal display panel — the time of 64 gradation displays — the maximum luminosity — eyes are used 64 gradation. From this, when lowering luminosity by lightness adjustment, the period until an eye is used 32 gradation. Thus, if a circuit is constituted, when screen intensity is dark, the number of gradation displays will decrease.

[0408]However, in the method which makes TFT11 by the side of EL element 15 turn on and off (the current which flows into EL element 15 is indicated by intermittent), a luminosity can be freely adjusted with adjustment of a "off" period. In that case, even if the lightness adjustment by this invention changes gamma adjustment and linearity changes a luminosity, it can hold. Since the power supply voltage Vdd is also a fixed value, a composition top is also advantageous.

[0409]The Gaussian distribution of the luminosity of a screen can be easily carried out by controlling an on-off state to become Gaussian distribution from on a screen about TFT11d down. Most control has an unnecessary operation. This method will be explained later.

[0410]It is necessary to set to 0.5 or more msec the cycle which turns EL element 15 on and off. When this cycle was short, it will not be in a perfect black display state with the afterimage characteristic of human being's eyes, but a picture came to have faded, and resolution came to have fallen. It will be in the displaying condition of a data-hold type display panel. However, when an on-off cycle is set to 100 or more msec, it is visible to a flickering state. Therefore, the on-off cycle of the EL element should be made less than more than 0.5microsec100msec. The on-off cycle should be made still more preferably 30 or less msec of 2 or more msec. The on-off cycle should be made still more preferably 20 or less msec of 3 or more msec.

[0411]If the number of partitions of the black picture 1312 is set to one, it can realize good animation display, but a flicker of a screen is in sight easily. Therefore, it is preferred to divide a black insert portion into plurality. However, if the number of partitions is made too much large, an animation Japanese quince will occur. The number of partitions should carry out to eight or less [1 or more]. Or more 1 thing to do to five or less is still more preferably preferred.

[0412]As for the number of partitions of a black picture, it is preferred to constitute so that it can change by the still picture and an animation. In $N=4$, 75% is a black picture and 25% of the number of partitions is image display. At this time, the number of partitions 1 scans 75% of black indicator to the sliding direction of a screen in the state of 75% of black obi. It is the number of partitions 3 which is scanned at 3 blocks of 25% of black picture, and 25/3% of display screen. A still picture increases the number of partitions. An animation lessens the number of partitions. According to an inputted image, it may perform automatically (animation detection etc.), and a user may perform a change manually. What is necessary is just to constitute so that it can change to the image of a display, etc. and may be made them corresponding to an input plug socket.

[0413]For example, in a cellular phone etc., the number of partitions is made or more into ten in a wallpaper display and an input screen (it may turn on and off for everyH extremely). When displaying the animation of NTSC, the number of partitions is made or less [1 or more] into five. As for the number of partitions, it is preferred to constitute so that it can change to three or more multi stage stories. For example, it is number-of-partitions nothing, 2, 4, 8, etc.

[0414]The rate of a black picture over all the display screens has preferred or more 0.2 thing to do to 0.9 (it will be nine or less [1.2 or more] if it displays by N) or less, when area of the full screen is set to 1. It is preferred to use 0.6 (if it displays by N, it will be six or less [1.25 or more]) especially or less [0.25 or more]. The improvement effect in animation display is low in it being 0.20 or less. The luminosity of a display portion becomes it high that it is 0.9 or more, and it becomes that a display portion moves up and down that it is easy to be recognized visually.

[0415]As for the frame number per second, 100 (not less than 10 Hz 100 Hz or less) or less [10 or more] are preferred. 65 (not less than 12 Hz 65 Hz or less) or less [further 12 or more] are preferred. When there are few frame numbers, a flicker of a screen comes to be conspicuous, if there are too many frame numbers, the writing from the driver circuit 14 etc. will become painful, and resolution will deteriorate.

[0416]Anyway, in this invention, the luminosity of a picture can be changed by control of the gate signal line 17. However, it cannot be overemphasized that the luminosity of a picture may change the current (voltage) impressed to the source signal line 18, and may be performed. It cannot be overemphasized that it may carry out combining control of the gate signal line (using drawing 33, drawing 35, etc.) 17 explained previously and changing the current (voltage) impressed to the source signal line 18.

[0417]It cannot be overemphasized that the above matter can also apply the pixel configuration of voltage programs, such as drawing 54, drawing 67, and Drawing 103. For example, what is necessary is just to carry out on-off control of the TFT11e in drawing 67.

[0418]The time which sets only the period of $1/F/N$ of the gate signal line 17b to Vgl is $1/F$ (it does not limit to $1/F$.) so that it may illustrate to drawing 36. An unit time period may be sufficient. Any time may be sufficient among periods. When only a predetermined period makes unit time one [EL element 15] among them, it is because it is what obtains predetermined average luminance. The gate signal line 17b is immediately set to Vgl, and it is made however, better [for EL element 15 to emit light after the program period (1H) of drawing 36 (a)]. It is because it becomes difficult to be influenced by the retention characteristic of the capacitor 19 of drawing 1. In drawing 36 (b), as the sign and arrow of A and B show, the period of one F/N may be constituted so that a position may be changed. This change is also easily realizable. It is because what is necessary is just to constitute so that timing (when [of $1/F$] is L level used?) of the data impressed to ST in drawing 2 may be adjusted or changed.

[0419]The period ($1/F/N$) which sets the gate signal line 17b to Vgl may be divided into plurality so that it may illustrate to drawing 37 (number of partitions K). That is, the period set to Vgl carries out the period of $1F/(K/N)$ K times. If it controls in this way, an image display state will become about drawing 31 (b), ($K=2$), and drawing 31 (c) and ($K=3$). By dividing into plurality the picture part (picture display part 311) made to turn on in this way, generating of a flicker can be controlled and image display of a low frame rate can be realized. It is preferred to constitute so that the number of partitions of this picture may also be changed. For example, that a user pushes a lightness adjustment switch or by turning a brightness adjusting volume, this change is detected and the value of K is changed. It may constitute so that it may be manual or may be made to change with the contents of the picture to display, and data automatically.

[0420]Thus, it is also easily realizable to change the value (number of partitions of the picture display part 311) of K. It is because what is necessary is just to constitute so that timing (when [of 1F] is L level used?) of the data impressed to ST in drawing 2 may be adjusted or changed.

[0421]In drawing 37, the period ($1/F/N$) which sets the gate signal line 17b to Vgl is divided into plurality (number of partitions K), and although the period set to Vgl presupposed that the period of $1F/(K/N)$ is carried out K times, it is not this-limited. L ($L=K$) time operation of the period of $1F/(K/N)$ may be carried out. That is, this invention displays the picture 21 by controlling the period (time) passed to EL element 15. Therefore, carrying out L ($L=K$) time operation of the period of $1F/(K/N)$ is included in the technical idea of this invention. The luminosity of the picture 21 can be changed in digital one by changing the value of L. For example, by $L=3$, 50% of luminosity (contrast) change is set to $L=2$. These control is also easily realizable by circuitry, such as drawing 2, drawing 35, drawing 60, and drawing 74.

[0422]When dividing the viewing area 311 of a picture, the period set to Vgl does not limit the gate signal line 17b to the same period. For example, the period set to Vgl as shown in drawing 38 is good also as two or more periods like t_1 and t_2 .

[0423]The above example turns the display screen 21 on and off by connecting the current which intercepts the current which flows into EL element 15, and flows into an EL element (lighting, astigmatism light). That is, multiple times and approximately same current are sent through TFT11a by the electric charge held at the capacitor 19. This invention is not limited to this. For example, the method which turns the display screen 21 on and off (lighting, astigmatism light) may be used by carrying out the charge and discharge of the electric charge held at the capacitor 19.

[0424]Drawing 303 shows the example. In the pixel configuration of drawing 1, TFT11e which carries out a switching element is arranged or formed in the both ends of the capacitor 19. By impressing ON state voltage (Vgl) to the gate signal line 17e connected to the gate terminal of TFT11e, and the both ends of the capacitor 19 are short-circuited. [TFT11e] Vg voltage turns into Vdd voltage and it becomes impossible therefore, to pass TFT11a with current.

[0425]Of course, a switching element is arranged or formed between the drain (D)-gate (G) terminals of TFT11a, and even if it short-circuits between the drain (D)-gate (G) terminals of TFT11a, TFT11a can be prevented from sending current. Therefore, it cannot be overemphasized that this composition may be used. For example, it is the composition of constituting so that the gate terminal of TFT11b of drawing 1 and the gate terminal of TFT11c can be controlled individually, making TFT11b one, and short-circuiting between the drain (D)-gate (G) terminals of TFT11a. This method is applicable also to drawing 21, drawing 43, drawing 71, and drawing 22. In drawing 21, drawing 43, drawing 71, and drawing 22, it is the composition of impressing ON state voltage (Vgh) to the gate signal line 17b, making TFT11d one, and short-circuiting between the drain (D)-gate (G) terminals of TFT11a.

[0426]Of course, it cannot be overemphasized that the above composition (the method to which the charge and discharge of the maintenance electric charge of TFT11 for a drive are carried out, the method which short-circuits between the drain (D)-gate (G) terminals, etc.) is applicable also to the pixel configuration of a voltage drive of drawing 54, drawing 67, drawing 68, Drawing 103, etc.

[0427]TFT11e is not limited to switching elements, such as TFT. The charge and discharge of the electric charge of the both ends of the capacitor 19 are carried out, and which thing may be sufficient as that. For example, MIM, TFD (thin-film diode), a thyristor, a barista, etc. may be sufficient. Not the thing that limits the both ends of the capacitor 19 to what carries out charge and discharge but the thing which can shift compulsorily the terminal voltage Vg of the element for a drive which sends current through EL element 15 in the current OFF direction may be used. For example, it may constitute so that it may run and Vg voltage can be shifted with voltage using a capacitor etc.

[0428]In the composition of Drawing 303, since the electric charge of the capacitor 19 is discharged by operation of TFT11e, current cannot be again sent through EL element 15. However, the brilliance control of the display screen 21 can be easily carried out from that of controlling a time interval until it makes TFT11e one (adjustment). The color adjustment of the display screen 21 can be easily carried out from that of controlling a time interval until TFT11e makes every R, G, and B one (adjustment). It cannot be overemphasized that the composition of Drawing 303 is combinable with other examples given [such as N time pulse drives, such as a reverse-bias-voltage method and drawing 87, and a Gaussian distribution drive, and a block drive, / this] in a specification. Since other composition and operation have already explained, they are omitted. The above matter is the same also about other this inventions.

[0429]It was a method which intercepts the current which flows into TFT11a by making TFT11e one [Drawing 303]. However, it is also possible by using TFT11a as N channel etc. to control to make the current which flows into TFT11a for a drive increase. That is, when the TFT11e operates, it can be said that Screen 21 uses a white display (white raster) (a screen is eliminated on a white screen). the pixel of RGB — among them, when the TFT11e of at least 1 color operates, it can be said that Screen 21 uses R, G, or a B display (R, G, or B color is strongly displayed for a screen). It cannot be overemphasized that P channel or N channel may be sufficient as TFT11e. PWM modulation can also be carried out by making TFT11e turn on and off. It cannot be overemphasized that the above matter is applicable to other examples of this specification.

[0430]Drawing 303 composition is a method which discharges the electric charge of the capacitor 19 thoroughly. Therefore, the electric charge (image data) held at the capacitor 19 will be eliminated. The composition of Drawing 304 divided the capacitor 19 into the capacitors 19a and 19b of plurality (an example two), and forms or arranges TFT11e to the both ends of one capacitor (an example 19b).

[0431]Drawing 304 shows the example. By impressing ON state voltage (Vgl) to the gate signal line 17e connected to the gate terminal of TFT11e, and the both ends of the capacitor 19b are short-circuited. [TFT11e] Therefore, Vg voltage becomes closer to Vdd voltage, and lessens the current which TFT11a sends (it restricts).

[0432]Therefore, in the composition of Drawing 304, the current which TFT11a sends is not intercepted thoroughly (the constant of the capacitors 19a and 19b can be set up intercept thoroughly, of course). In the composition of Drawing 303, since the electric charge of the capacitor 19 is discharged by operation of TFT11e, current cannot be again sent through EL element 15. However, if TFT11e is turned off, although display luminance is lower than before, a picture can be again expressed as the composition of Drawing 304. that of controlling a time interval until it makes TFT11e one (adjustment) -- the brilliance control of the display screen 21 -- texture -- it can carry out to adjustment (change) warm.

[0433]Even if it is in solid difference for every panel (when manufacturing variation occurs etc.), the variation in display luminance can be adjusted by making TFTe make one or turn off for every manufactured display panel. In this case, OFF may always be TFT11e one or always. From that of controlling a time interval until TFT11e makes every R, G, and B one (adjustment), it opts for the color adjustment of the display screen 21, and adjusts easily warm. What is necessary is just to adopt the composition explained with Drawing 294 etc. as a pixel configuration. It cannot be overemphasized that it is combinable with other examples given in a book specification, such as a reverse-bias-voltage method, also about the composition of Drawing 304 etc. Since other composition and operation have already explained, they are omitted. The above matter is the same also about other this inventions.

[0434]In Drawing 304, although two of the capacitors 19a and 19b were used, it does not limit to this. Three or more capacitors may be formed, and switching elements, such as TFT, may be arranged so that the charge and discharge of the electric charge of each capacitor can be carried out. In this composition, the luminosity of the display screen 21 can be changed in other stages. The color balance of RGB can also be adjusted on a multi stage story (change).

[0435]It was a method which decreases the current which flows into TFT11a by making TFT11e one [Drawing 304]. However, it is also possible by using TFT11a as N channel etc. to control to make the current which flows into TFT11a for a drive increase. That is, when the TFT11e operates, luminosity of Screen 21 can be made high. the pixel of RGB -- R, G, or B color can be made to increase the color of Screen 21, when the TFT11e of at least 1 color operates among them (R, G, or B color is strongly displayed for a screen.) There may be a plural color like R and B.

[0436]Although it was the composition which formed the one capacitor 19a between the gate (G) terminal of TFT11a, and the sauce (S) terminal in Drawing 304, it does not limit to this. The composition which formed two or more capacitors 19a in series or in parallel between the gate (G) terminal of TFT11a and the sauce (S) terminal may be used. The current which flows into TFT11a may be decreased by forming switching TFT11e for short in the both ends of at least one capacitor among this capacitor, and making TFT11e one. It cannot be overemphasized that the above matter is applied also to the pixel configuration of a current mirror or the pixel configuration of a voltage drive.

[0437]In the pixel configuration of the current mirror explained by drawing 21, drawing 43, drawing 71, etc., Drawing 305 shows the composition in which TFT11e which short-circuits the both ends of the capacitor 19 for maintenance was formed (arrangement). Since operation is the same as that of Drawing 303 etc., explanation is omitted. The same may be said of Drawing 305. Since operation can be easily guessed from explanation or explanation of Drawing 304 with Drawing 304, explanation is omitted.

[0438]Drawing 307 shows the example of a voltage drive of a pixel of 2TFT composition. The current drive system and operation which also explained the composition of Drawing 307 with Drawing 303 etc. are the same. TFT11e is formed in the both ends of the capacitor 19 for maintenance (arrangement). Like the composition previously explained also with the composition of Drawing 307, since the electric charge of the capacitor 19 is discharged by operation of TFT11e, current cannot be again sent through EL element 15. However, the brilliance control of the display screen 21 can be easily carried out from that of controlling a time interval until it makes TFT11e one (adjustment). The color adjustment of the display screen 21 can be easily carried out from that of controlling a time interval until TFT11e makes every R, G, and B one (adjustment).

[0439]It is also possible also about the composition of Drawing 307 to control to make the current which flows into TFT11a for a drive increase by making TFT11e one by using TFT11a as N channel etc. That is, when the TFT11e operates, it can be said that Screen 21 uses a white display (white raster) (a screen is eliminated on a white screen). the pixel of RGB -- among them, when the TFT11e of at least 1 color operates, it can also be said that Screen 21 uses R, G, or a B display (R, G, or B color is strongly displayed for a screen).

[0440]Drawing 308 shows drawing 67 and the example which applied the technical concept of Drawing 303 to the pixel configuration of the voltage program (drive) of drawing 68. The current drive system and operation which also explained the composition of Drawing 308 with Drawing 303 etc. are the same. That is, TFT11e is formed in the both ends of the capacitor 19 for maintenance, and the electric charge of the capacitor 19 is discharged by operation of TFT11e. Therefore, it becomes a black display. The color adjustment of the display screen 21 can be easily carried out from that of controlling a time interval until it can carry out the brilliance control of the display screen 21 easily, and it carries out it and TFT11e makes every R, G, and B one [that / of controlling a time interval until it makes TFT11e one (adjustment)] (adjustment). Since it is the same as that of a previous example about other matters, explanation is omitted.

[0441]In drawing 33, it illustrated so that the pixel row which adjoined might be made to turn on one by one (display), but this invention is not limited to this. Interlace scanning may be carried out so that it may illustrate to drawing 39.

[0442]Interlace scanning writes a picture in an odd number pixel row (drawing 39 (a) write-in pixel row 391), writes a picture in an even number pixel row in the 2nd next field (drawing 39 (b) write-in pixel row 391), and is an image display method in the 1st field. The pixel row which is not written in holds the image data of the front field (maintenance pixel row 392). Thus, a flicker can be decreased by carrying out interlace scanning with an EL display.

[0443]In the drive of drawing 39, the gate signal line 17b of all the even number pixel rows (or plurality) can be done in common, and the gate signal line 17b of all the odd number pixel rows (or plurality) can be done in common. Therefore, the number of leading about of the gate signal line 17 is substantially reducible. When displaying the displaying condition 311 and the non-display state 312 for the full screen by turns, all the gate signal lines 17b can be done in common. These composition is effective with especially composition without three sides, such as drawing 27.

[0444]Although interlace scanning presupposed that a picture is written in an odd number pixel row, and a picture is written in an even number pixel row in the 2nd next field in the 1st field, it is not limited to this. the 1st field -- a 2-pixel line -- it may fly and come out, and may write in two pixel rows of pictures at a time, and a picture may also be written in every 2 which were not

written in the 1st field pixel rows in the 2nd next field. Three every pixel rows or four every pixel rows may be sufficient. In the 1st field, two pixel rows of pictures may be written in from each 2nd line of a screen (see Drawing 106 (a)), and a picture may also be written in every two pixel rows from the 1st line in the 2nd next field (see Drawing 106 (b)). The pixel row currently written in so that it may illustrate to Drawing 106, or the pixel row to write in may be controlled to become the non display regions 312. In the 1st field, a picture may be written in toward the bottom from on a screen, and a picture may also be written in toward a top from under a screen in the 2nd field. These are also all contained in the concept of interlace scanning.

[0445]Interlace scanning is also easily realizable by enforcing the method explained by drawing 33 and drawing 56. It is because the pixel row applicable to the viewing area 312 which is not made to turn on should just make TFT11d shown in drawing 1 (a) turn off.

[0446]The black display area 312 and interlace scanning are combinable so that it may illustrate to drawing 50 with a natural thing. In drawing 50 (a), the scan size 501 which consists of the write-in pixel row 391 and the maintenance pixel row 392 is shifted one by one. In drawing 50 (a), the picture is written in from the 1st line. Drawing 50 (b) also shifts the scan size 501 which consists of the write-in pixel row 391 and the maintenance pixel row 392 one by one in a similar manner. In drawing 50 (b), the picture is written in from the 2nd line.

[0447]application of interlaced scanning (interlace scanning etc.) will control the variation in drive TFT11 of the pixel 16 — things can be carried out. Drive TFT11a of the pixel row which adjoined approaches, and Drawing 322 is formed (arrangement). That is, TFT11a1 of the pixel 16a and TFT11a2 of the pixel 16b approach, and they are arranged. The gate signal line 17a1 which controls the pixel 16a, and the gate signal line 17a2 which controls the pixel 16b also approach, and is arranged. The gate signal line 17a1 and the gate signal line 17a2 approach, and are arranged in order to consider the pixel 16a and the pixel 16b as arrangement of axial symmetry.

[0448]The characteristic of TFT11a2 and TFT11a1 approximates by approaching and arranging TFT11a1 of the pixel row containing the pixel 16a, and TFT11a2 of the pixel row containing the pixel 16b, as shown in Drawing 322. Hereafter, the drive method using the pixel arrangement configuration of Drawing 320 is explained using Drawing 323 and Drawing 324.

[0449]Drawing 323 is an explanatory view of other examples which increase the current which flows into the source signal line 18. It is a method which chooses two pixel rows simultaneously, carries out the charge and discharge of the parasitic capacitance 404 of the source signal line 18, etc. with the current with which two pixel rows were united, and improves current writing shortage substantially. However, since two pixel rows are chosen simultaneously, the current which per pixel drives can be decreased to one half of the current (program current) sent through the source signal line 18. Therefore, since the current which flows into EL element 15 can be decreased, there is little degradation of EL element 15. Here, in order to explain easily, it explains as $N=2$ as an example (the current sent through a source signal line is doubled). Drawing 87, drawing 88, etc. explain a similar drive method. Therefore, please also refer to these methods.

[0450]Drawing 323 (a) is illustrating the writing state to the display image 21. In Drawing 323 (a), 871 (871a, 871b) is a write-in pixel row. That is, 2 pixels is written in. The twice as many program current I_w as the current written in a pixel is impressed to the source signal line 18. Therefore, since the number of pixel rows is two, the current written in 1 pixel will be 1 time (predetermined value). As for the state of Drawing 323 (a), the pixel 16a and one pixel row of pixels 16b will be chosen, respectively. That is, current programming will be carried out as operated in drive TFT11a1 of the pixel which approached, and 11a2 (the pixel configuration of drawing 1 is assumed). The current I_w sent through the source signal line 18 is supplied from this TFT11a1 for a drive arranged by approaching, and TFT11a2 for a drive.

[0451]Since TFT11a1 for a drive and TFT11a2 for a drive approach and they are formed, the characteristic is mostly in agreement. Therefore, if the program current I_w which flows into the source signal line 18 sets to two (μA), TFT11a1 for a drive and TFT11a2 for a drive will supply 1 (μA) every current, respectively.

[0452]From the above thing, if the twice as many program current I_w as a predetermined value is sent through the source signal line 18, the current of a predetermined value will be correctly programmed by the pixel. Although the current sent through the source signal line 18 was made into twice ($N=2$), it is not limited to this. It could be twice in order to understand easily to the last. In the real drive, in order to carry out one half of display surface products, program current makes the astigmatism light field 312 4 times.

[0453]In the pixel configuration of Drawing 322, one screen is rewritten in the 2 field (one frame = 2 field). An even line is rewritten, and the 1st field explains in the 2nd field noting that an odd line is rewritten. With Drawing 323, it explains rewriting the even line, and with Drawing 324, it explains noting that the odd line is rewritten.

[0454]In Drawing 323, 871 (871a, 871b) is a write-in pixel row, and is writing in 2 pixels. The twice as many program current I_w as the current written in odd pixels is impressed to the source signal line 18. Therefore, the write-in pixel rows 871a and 871b serve as the same display. Then, EL element 15 of the pixel which corresponds to an odd line so that it may illustrate to Drawing 323 (b) is changed into an astigmatism light state (OFF state voltage is impressed to the gate signal line 17b, and the current from TFT11a for a drive is kept from flowing into EL element 15 in drawing 1). image data is written in the pixel, shifting the above operation a 2-pixel item every. After the scan of the 1 field is completed, all even lines serve as the astigmatism light 312, and an odd line serves as the lighting 311 so that it may illustrate to Drawing 323 (c).

[0455]Drawing 324 is illustrating the image data writing state of the 2nd field. In Drawing 324 (a), 871 (871a, 871b) is a write-in pixel row, and is writing in 2 pixels. The twice as many program current I_w as the current written in odd pixels is impressed to the source signal line 18. Therefore, the write-in pixel rows 871a and 871b serve as the same display. EL element 15 of the pixel which corresponds to an even line so that it may illustrate to Drawing 324 (b) like the 1st field is changed into an astigmatism light state. image data is written in the pixel, shifting the above operation a 2-pixel item every. After the scan of the 1 field is completed, all odd lines (odd-numbered pixel row) serve as the astigmatism light 312, and an even line (even-numbered pixel row) serves as the lighting 311 so that it may illustrate to Drawing 324 (c).

[0456]As mentioned above, one screen is rewritten by one frame (2 field) by repeating the drive of Drawing 323 and Drawing 324 by turns. As shown in Drawing 322, by making two pixel rows into a pair, TFT11a for a drive of two pixel rows was made to approach, and it has controlled that characteristic variation occurs. Therefore, uniform image display is realizable.

[0457]Pixel arrangement of Drawing 322 and a drive method are not limited only to the pixel configuration of drawing 1. For example, it cannot be overemphasized that it is applicable also to the pixel configuration of voltage program methods, such as

drawing 21, drawing 43, drawing 71, a pixel configuration of the current mirror of drawing 22, drawing 54, drawing 67, drawing 68, and Drawing 103.

[0458]In the pixel configuration of drawing 21, drawing 43, and drawing 71, the current value impressed to the source signal line 18 is programmed by the capacitor 19 by impressing ON state voltage (Vgl) to the gate signal line 17a. The data which corresponds to a video signal from the current source 403 in the source drivers IC 14 is impressed to the source signal line 18 so that it may illustrate to drawing 40. When current mirror efficiency is 1, said current flows into TFT11b and, as for the programmed current, this current is impressed to EL element 15. Probably, **** does not have these relations (timing waveform etc.) in explanation, since they can divert the matter illustrated to drawing 33 or are similar. However, when performing current programming, it may be necessary to control individually one or OFF timing of TFT11c and TFT11d. In this case, it cannot be overemphasized that it is necessary to make into another gate signal line 17 the gate terminal which makes TFT11c and TFT11d turn on and off.

[0459]In order to enforce the methods of presentation, such as drawing 31, it is necessary to intercept the current sent through EL element 15. TFT11e is added so that it may illustrate to drawing 40 for the purpose of this interception. By setting the gate terminal of TFT11e to Vgl, current is impressed to EL element 15 and the current to EL element 15 will be in an interception (astigmatism light state) state by setting the gate terminal of TFT11e to Vgh.

[0460]Therefore, the image display explained by drawing 31 etc. is realizable by impressing the signal wave form of the gate signal lines 17a and 17b explained by drawing 33 etc.

[0461]The non image viewing area 311 and the image display region 312 may change an odd number pixel row and an even number pixel row to every frame (field) so that it may illustrate to drawing 61. Drawing 61 (a) displays an odd number pixel row, and by non-display, then following FIMU (field) (see drawing 61 (b)), an odd number pixel row is carried out to a non-example, and it carries out an even number pixel row for an even number pixel row to a display.

[0462]Thus, if it displays so that non display regions and a viewing area may be repeated for every pixel row, generating of a flicker will be controlled substantially.

[0463]In drawing 61, although a non-display pixel row and a display pixel line are used for every pixel row, though it does not limit to this and is made a non-display pixel row and a display pixel line for every pixel row beyond every two pixel rows or it, it is good.

[0464]For example, if it is every two lines, in the 1st field (frame), 1 pixel-row eye and 2 pixel-row eye will consider it as a display pixel line, and will make 3 pixel-row eye and 4 pixel-row eye a non-display pixel row. 5 pixel-row eye and 6 pixel-row eye are display pixel lines. In the 2nd next field (frame) of the 1st field, 1 pixel-row eye and 2 pixel-row eye consider it as a non-display pixel row, and make 3 pixel-row eye and 4 pixel-row eye a display pixel line. 5 pixel-row eye and 6 pixel-row eye are non-display pixel rows. In the 3rd next field (frame), 1 pixel-row eye and 2 pixel-row eye consider it as a display pixel line, and make 3 pixel-row eye and 4 pixel-row eye a non-display pixel row. 5 pixel-row eye and 6 pixel-row eye are display pixel lines.

[0465]Wording of the field and a frame is used for homonymy, or this specification has separated it. Generally one frame comprises interlace driving of NTSC in the 2 fields. However, in a progressive drive, one frame is the 1 field. Thus, in the world of the signal of an image, the field and a frame are used properly. However, in this invention, the picture displayed on a display panel can apply progressive, an interlace, or either. Therefore, it is considered as expression that whichever may be sufficient. It is a unit of time for one to finish writing a screen notionally also with the field or a frame.

[0466]The method of presentation of drawing 62 is also effective. In order to explain easily here, in drawing 62 (a), drawing 62 (c) considers it as the 3rd field (the 3rd frame) by the 1st field (the 1st frame) and drawing 62 (b) considering it as the 2nd field (the 2nd frame), and drawing 62 (d) considers it as the 4th field (the 4th frame).

[0467]In the 1st field (frame), 1 pixel-row eye and 2 pixel-row eye consider it as a non-display pixel row, and make 3 pixel-row eye and 4 pixel-row eye a display pixel line. 5 pixel-row eye and 6 pixel-row eye are display pixel lines. In the 2nd field (frame), an odd number pixel row eye considers it as a display pixel line, and makes an even number pixel row eye a non-display pixel row. In the 3rd field (frame), 1 pixel-row eye and 2 pixel-row eye consider it as a display pixel line, and make 3 pixel-row eye and 4 pixel-row eye a non-display pixel row. In the 4th field (frame), an odd number pixel row eye considers it as a non-display pixel row, and makes an even number pixel row eye a display pixel line. Henceforth, it repeats successively from the displaying condition of the 1st field (the 1st frame).

[0468]In the drive method of drawing 62, it is considered as one loop in the 4 field (frame). Thus, by performing image display in plural fields (multiple frame), generating of a flicker is controlled rather than drawing 61 in many cases.

[0469]In the example of drawing 62, in the 1st field (frame), it is considered as 2 pixel-row eye [every] non-display pixel row, and although it was considered as 1 pixel-row eye [every] non-display pixel row, it does not limit to this in the 2nd field (frame). In the 1st field (frame), it is considered as 2 pixel-row eye [every] non-display pixel row, and although it was considered as 1 pixel-row eye [every] non-display pixel row, it does not limit to this in the 2nd field (frame). In the 1st field (frame), consider it as 4 pixel-row eye [every] non-display pixel row, and in the 2nd field (frame). Consider it as 2 pixel-row eye [every] non-display pixel row, and in the 3rd field (frame). It is considered as 1 pixel-row eye [every] non-display pixel row, is considered as 4 pixel-row eye [every] non-display pixel row in the 4th field (frame), is considered as 2 pixel-row eye [every] non-display pixel row in the 5th field (frame), and is good also as a pixel row eye [every] non-display pixel row in the 6th field (frame).

[0470]The drive method of this invention is easy to realize display effects (animation effect etc.). Drawing 63 is the method of presentation with which a viewing area appears one by one with drawing 63 (a) → drawing 63 (b) → drawing 63 (c) → drawing 63 (d). An animation effect is realizable by scrolling the non display regions 312 slowly. These control is also easily realizable by circuitry, such as drawing 2, drawing 60, and drawing 74. That is, a black display state is not written in as an image, but control of the gate signal line 17b etc. can realize an animation effect easily.

[0471]The display panel which holds 1 field (one frame) period data to pixels, such as a liquid crystal display panel, has the technical problem that an animation Japanese quince occurs. Since CRT is only displayed with an electron gun for a moment, the problem of an animation Japanese quince is not generated.

[0472]An effective means is black insertion solving this technical problem. This invention can realize easily the black insertion method made close to CRT which reached to an extreme of animation display.

[0473]Drawing 64 shows the place where the character F moves downward from on a screen. However, the character was set to F in order to draw easily. The non-display state (drawing 64 (b), (d), (f)) is inserted between image display (drawing 64 (a), (c), (e)) so that it may illustrate to drawing 64. Therefore, a picture serves as a discontinuous display. The sake. An animation Japanese quince does not occur but good animation display can be realized.

[0474]What is necessary is just to adopt the circuitry of drawing 60 for making the full screen this business with non display regions. The difference with drawing 2 is the point of providing the ENBL terminal 601. The ENBL terminal 601 is connected to one terminal of OR circuit 602 in which the gate signal line 17 was formed. By using an ENBL terminal as L level, a V_{gh} level will be outputted to all the gate signal lines 17b, TFT11d which supplies current to EL element 15, or 11e will be in an OFF state, and the full screen serves as the non display regions 312. Normal operation is carried out when an ENBL terminal is H level.

[0475]Although drawing 2, drawing 60, drawing 74, and drawing 84 explained the data inputted into ST terminal as shifting one by one with the clock (serial operation), it does not limit to this. For example, it may be a parallel input which determines the on-off state of each gate signal line at once (in a part for the number of a controller or the gate signal line 17, the composition which are outputted at once and for which it opts, etc., the ONFUFU logic of all the gate signal line corresponds).

[0476]Although the example of drawing 64 was animation display, operation of an animation effect, such as carrying out flash plate INGU, is also easy for every R, G, and B (refer to drawing 65). As for the picture of the red display 311R, and drawing 65 (b), in drawing 65, the picture of the green display 311G and drawing 65 (c) of drawing 65 (a) are the pictures of the blue display 311B. The picture of the red display 311R of drawing 65 (a) and drawing 65 (b) insert the picture of the green display 311G, and drawing 65 (c) is inserting the non-display state (drawing 65 (b), (d), (f)) between each of the picture of the blue display 311B. If drawing 65 (f) is slowly carried out from drawing 65 (a), this operation can be displayed as the picture of R, G, and B is carrying out flash plate INGU.

[0477]a picture which is different although the example of drawing 64 was animation display -- operation of an animation effect, such as it being alike and carrying out flash plate INGU, is also easy (refer to drawing 66). As for the 1st picture 311a and drawing 66 (b), in drawing 66, the 2nd picture 311b and drawing 66 (c) of drawing 66 (a) are the 3rd picture 311B. Drawing 66 (a) is inserting the non-display state (drawing 66 (b), (d), (f)) between each of the 1st picture 311a, the 2nd picture 311b of drawing 66 (b), and the 3rd picture 311B of drawing 66 (c). If drawing 66 (f) is slowly carried out from drawing 66 (a), this operation can be displayed as the 1st, 2nd, and 3rd picture is carrying out flash plate INGU.

[0478]The above example was the method (Elements of the Invention) of sending N times as much current through the source signal line 18 to a predetermined value notionally, and only the period of 1/N sending N times as much current through EL element 15, and obtaining desired luminosity. By this method (Elements of the Invention), the technical problem of the write-in contingency by existence of the parasitic capacitance 404 was solved.

[0479]Luminous efficiency of the drive method increased N times improves rather than 1 time (the conventional drive system). TFT11b (capacitor 19 side) of drawing 1 runs through this, and it is influence of voltage. the direction increased N times -- this -- it runs and the influence of voltage can be reduced. Eight or less times 1.5 or more-time are suitable for N multiple. Since the luminous efficiency of EL will fall that it is more than this, efficiency falls as a whole. Preferably, as for N times, more than twice as many 6 or less times as this are preferred. I hear that a light emission period is carried out to increasing N times at 1/N, and it is. It will be said that it is preferred to carry out a light emission period to carrying out and N making backlash 6 or less times more than twice 1/6 or less [1/2 or more] (when it is the usual luminosity).

[0480]After this invention makes TFT11d turn off and intercepts the current to EL element 15, it can send current through EL element 15 like the point by making TFT11d one again. This invention applied this principle well, for example, sent current during the 1/N, and has obtained predetermined luminosity. Thus, it can drive because the current value to pass is held every pixel 16 at the capacitor 19. That is, it can be said that this invention will have applied the characteristic pixel configuration of an EL display panel well if the current value passed to EL element 15 is held.

[0481]drive TFT11a The composition of drawing 69 is the method of solving the technical problem of the writing shortage by existence of the parasitic capacitance 404, when it receives and driving ability forms twice (N-1) as many TFT11an as this.

[0482]The difference between drawing 69 and drawing 1 (a) is the point of having added TFT11an-1 of N-1 time drive and TFT11f for switching other than drive TFT11a. It explains focusing on the difference between drawing 1 and drawing 69. If current with TFT11an-1 and TFT11a is added, having been referred to as TFT11an-1 constitutes so that it may increase N times. Simply, the channel width W2 of TFT11an-1 is increased N-1 time of the channel width W1 of TFT11a. For example, if it is N= 10 and the channel width W1 of TFT11a will set to 1, it will be 9 times the channel width W2 of TFT11an-1 of this. Therefore, theoretically, if TFT11a sends the current of 1, TFT11an-1 has the capability to send 9 times as much current.

[0483]When sending N times as much current through the source signal line 18, in drawing 69, the driving current of TFT11an-1 was set to N-1 with the composition of drawing 69 because 1 time as much current as TFT11a which sends current was added to EL element 15. With the composition of drawing 71, since the current of TFT11b which sends current through EL element 15 does not flow into the source signal line 18, TFT11n needs to increase driving current N times.

[0484]In order to explain easily here, TFT11a shall presuppose that the current which becomes I1 is sent, and TFT11an-1 shall send the current of I_{n-1}. I1 It is referred to as +I_{n-1}=I_w (in this case, I_w carries out by N times the current I1 sent through EL element 15).

[0485]The voltage of V_{gl} will be impressed to a current programming period for the gate signal line 17a, and TFT11b, and 11f and 11c will be in an ON state. The voltage of V_{gh} is impressed and TFT11d of the gate signal line 17b is an OFF state. Therefore, the voltage equivalent to the program current I_w is programmed by the capacitor 19. that is, I1+I_{n-1} =I_w (in this case, I_w carries out by N times the current I1 sent through EL element 15) -- current flows into the source signal line 18.

[0486]Next, the voltage of V_{gh} will be impressed to EL element 15 for the gate signal line 17a in the period which sends current, and TFT11b, and 11f and 11c will be in an OFF state. Therefore, the source signal line 18 and the pixel 16 are separated. As for the gate signal line 17b, the voltage of V_{gl} will be impressed and TFT11d will be in an ON state. Therefore, the current I1 corresponding to 1/N of the program current I_w flows into EL element 15.

[0487]By driving as mentioned above, N times as much current as the current (current sent through an EL element) of a desired value can be sent through the source signal line 18. Therefore, the influence of the parasitic capacitance (stray capacitance) 404 is excepted, and current programming can fully be performed to the capacitor 19. On the other hand, current can be impressed

to a desired value at EL element 15.

[0488]In drawing 69, although TFT11an-1 with the current capability of N-1 and one piece are produced to a pixel, it does not limit to this. As shown in drawing 70, two or more TFT(s) (drawing 70 TFT11n1-TFT11n6) may be produced. Since operation is the same as that of drawing 69, explanation is omitted.

[0489]drive TFT11a The composition of drawing 69 is the method of solving the technical problem of the writing shortage by existence of the parasitic capacitance 404, when it receives and driving ability forms twice (N-1) as many TFT11an as this.

[0490]The composition of drawing 69 can be developed also in the current mirror method illustrated to drawing 21, drawing 43, and drawing 71. What is necessary is just to form TFT11n which has N times as much driving ability so that it may illustrate to drawing 71. However, it changes with current mirror composition and TFT11f [like] does not have necessity.

[0491]In drawing 71, the ratio of the channel width W2 of TFT11n and the channel width W1 of TFT11b is set to N:1. In order to explain easily here, TFT11b shall presuppose that the current which becomes I1 is sent, and TFT11n shall send the current of In. It is referred to as $I_n = I_w$ (in this case, I_w carries out by N times the current I1 sent through EL element 15).

[0492]The voltage of Vgl will be impressed to a current programming period for the gate signal line 17a, and TFT11c and 11 d will be in an ON state. Therefore, the voltage equivalent to the program current I_w is programmed by the capacitor 19. that is, $I_n = I_w$ (in this case, I_w carries out by N times the current I1 sent through EL element 15) -- current flows into the source signal line 18. As for a little TFT11c and TFT11d, it is preferred to be able to shift timing and to control an on-off state. In this case, it is necessary to make separate the gate signal line which controls TFT11c, and the gate signal line which controls TFT11d, and to carry out independent control.

[0493]Next, the voltage of Vgh will be impressed to EL element 15 for the gate signal line 17a in the period which sends current, and TFT11c and 11 d will be in an OFF state. Therefore, the source signal line 18 and the pixel 16 are separated. Therefore, the current I1 corresponding to 1/N of the program current I_w flows into EL element 15.

[0494]By driving as mentioned above, N times as much current as the current (current sent through an EL element) of a desired value can be sent through the source signal line 18. Therefore, the influence of the parasitic capacitance (stray capacitance) 404 is excepted, and current programming can fully be performed to the capacitor 19. On the other hand, current can be impressed to a desired value at EL element 15.

[0495]The gate signal line 17b and TFT11e are provided in order to control so that only the non image display of drawing 30 etc. or a 1/N period sends current through EL element 15 as drawing 40 explained. Therefore, in the composition of drawing 71, when a 1/N period carries out the pulse drive of the current which sends further N times as much current, and is sent through EL element 15, the problem of the writing shortage by the parasitic capacitance 404 is completely lost. A black insertion display can be realized easily and good animation display can be realized.

[0496]The composition of drawing 71 is dramatically effective. For example, with the composition of only drawing 1, if it is going to realize $N=10$, it is necessary to impress 10 times as high pulse form current as a desired value to EL element 15. In this case, since the terminal voltage of EL element 15 becomes high, the necessity of designing Vdd voltage highly comes out. EL element 15 may deteriorate.

[0497]However, in the composition of drawing 71, if channel width W2 of TFT11n is made into 5 times of TFT11b and it programs with current high twice, it will be set to $5 \times 2 = 10$. Therefore, it is realizable if only one half of periods impress twice as many current as this to EL element 15. Therefore, the problem on which EL element 15 deteriorates does not have to be lost, either, and it is not necessary almost to make Vdd voltage high.

[0498]Conversely, if it is going to realize $N=10$ only by TFT11n, it is necessary to make channel width W2 of TFT11n into 10 times of TFT11b in the composition of drawing 71. If it increases 10 times, the forming face product of TFT11n occupies most area of a pixel. Therefore, a pixel numerical aperture becomes very small, or it becomes unrealizable. However, in the composition of drawing 71, since what is necessary is just to make channel width W2 of TFT11n into 5 times of TFT11b, sufficient pixel numerical aperture is realizable.

[0499]There are many realization methods of $N=10$. It is how to make channel width W2 of TFT11n into twice TFT11b, make channel width W2 of how to carry out period impression of one fifth for 5 times higher current at EL element 15, and TFT11n into 4 times of TFT11b, and carry out period impression of 1/2.5 for 2.5 times higher current at EL element 15 etc. That is, it is because what is necessary is just to make it multiplication set to 10 in consideration of the design (channel width W2) of TFT11n, the current sent through an EL element, and its period. Therefore, the value of N can be designed freely.

[0500]In drawing 71, although TFT11n with the current capability of N and one piece are produced to a pixel, it does not limit to this. As shown in drawing 72, two or more TFT(s) (drawing 72 TFT11n1-TFT11n5) may be produced. Since operation is the same as that of drawing 71, explanation is omitted.

[0501]The composition of drawing 69 of there being many realization methods of $N=10$ is also the same. It is how to make channel width W2 of TFT11an-1 into 4 times of TFT11a, make how to carry out period impression of one half for current high twice at EL element 15, and channel width W2 of TFT11an-1 into twice TFT11ab, and carry out period impression of one fifth for 5 times higher current at EL element 15 etc. That is, it is because what is necessary is just to make it multiplication set to 10 in consideration of the design (channel width W2) of TFT11an-1, the current sent through an EL element, and its period. Therefore, the value of N can be designed freely.

[0502]It is clear that the matter's explained above it is applicable also in drawing 69, drawing 70, drawing 75, drawing 82, and drawing 83. That is, this invention forms the drive TFT with large channel width in each pixel, and increases the current which drives the source signal line 18. And while increasing the current sent through EL element 15 explained by drawing 31 etc., it is the method or composition which makes a predetermined period the current sent through EL element 15.

[0503]The display explained by drawing 30, drawing 31, etc. is realizable by controlling turning on and off of TFT11d or TFT11e. Animation display can be improved and a luminosity can be adjusted with this display. Therefore, although it presupposed that the current which is proportional to an EL element at N times or N is impressed to EL element 15 in this invention, it does not limit to this. The composition of sending the current not more than 1 predetermined time or it through EL element 15 may be used. Even in this case, it is because the effect that animation display can be improved and a luminosity can be adjusted easily can be demonstrated.

[0504]Although drawing 1 and drawing 69 are also the same, when making TFT11d into an ON state, the characteristic variation

by the kink phenomenon of TFT11a can be controlled by making resistance high. This explained with the composition of drawing 1 (b). The variation in the current which flows into TFT11a decreases by arranging TFT11e of drawing 1 (b) and impressing Vbb voltage ($V_{gl} < V_{bb} < V_{gh}$) to the gate terminal of TFT11e.

[0505]Therefore, also in the pixel configuration of drawing 1 and drawing 69, it is preferred to impress Vbb voltage to the gate signal line 17b, and to make TFT11d one. That is, Vgh is impressed in an OFF state and TFT11d impresses Vbb in an ON state.

[0506]This control is easy. It is because what is necessary is just to carry out circuitry like drawing 74. It is because Vgh is impressed to the gate signal line 17b in an OFF state and Vbb can be impressed to the gate signal line 17b in an ON state, if the inverter of the output stage of the shift register 22b uses Vgh and Vbb as a power supply.

[0507]The on-off control of the gate signal line 17 presupposed that it is based on the data which the shift register 22 holds. However, the method which does not limit to control by the shift register 22, and does not form the shift register 22, but controls each gate signal line 17 uniquely may be used for the on-off control of the gate signal line 17. For example, the arbitrary gate signal lines 17 which output ON state voltage may be chosen in a multiplexer circuit. It may be parallel and all the gate signal lines may be pulled out, and it may constitute so that ON state voltage or OFF state voltage can be freely impressed to each gate signal line. From thus, that of constituting so that it may not be based on the held data of the shift register 22 but the arbitrary gate signal lines 17 can be chosen. Turning on and off of the display screens 21, such as drawing 31, drawing 32, drawing 87, drawing 88, Drawing 198, Drawing 201, Drawing 215, Drawing 218, Drawing 220, and Drawing 221, or strength processing of luminance distribution becomes easy.

[0508]Like drawing 1 (b), it cannot be overemphasized that TFT11e which impresses Vbb voltage may be formed or arranged separately so that it may illustrate to drawing 75. The current mirror composition of this matter is also the same. For example, TFT11f which impresses Vbb voltage so that it may illustrate to drawing 76 may be formed or arranged separately. The pixel configuration of drawing 54 is also the same. TFT11f which impresses Vbb voltage so that it may illustrate to drawing 77 may be formed or arranged separately.

[0509]In drawing 78, by separating into the plurality of TFT11a1 and TFT11a2, and connecting a gate terminal to a cascade, drive TFT11a can control a kink phenomenon, and can also control characteristic dispersion. This is the same about TFT11b of TFT11a of drawing 1, drawing 21, drawing 43, and drawing 71, TFT11a of drawing 69, TFT11b of drawing 71, etc. (adopting as composition of TFT for a drive is preferred).

[0510]Drawing 70 It called and it was presupposed that TFT11n etc. are divided into plurality in drawing 72. What is necessary is just to control whether TFT11n1 and TFT11n2 which were divided as other composition so that it might illustrate to drawing 73 are operated as an object for driving current improvement by potential (V_{gh} or V_{hl}) impressed to the gate signal line 17c. If TFT11f2 is made into an OFF state, the current which flows into the source signal line 18 will be set to one half when TFT11n1 and TFT11n2 are operating. These control is good to determine from the image display data of a display panel, and a viewpoint of power consumption.

[0511]The difference between drawing 75 and drawing 82 is the point of having connected the gate terminal of switching TFT11f to the gate signal line 17c. That is, the on-off state of TFT11f is not influenced by the potential state of the gate signal line 17a, but it is in the point that original control is realizable.

[0512]TFT11f of TFT11n is in the state separated from the pixel in an OFF state continuously. Therefore, it becomes a pixel configuration of drawing 1 (a). If the gate signal line 17c and the gate signal line 17a are used short-circuiting in logic, it will become the composition of drawing 75.

[0513]The problem of drawing 75 is a point that dispersion appears in the current which flows into EL element 15 for every pixel, when the characteristic gap of TFT11n, V_t of TFT11a, etc. has occurred for every pixel. If dispersion occurs on current, it will be rough also with uniform displays, such as a white raster, in a display image, and admiration will come out. In that respect, this problem is not generated with the composition of drawing 1.

[0514]Therefore, when the screen size of a display panel is small and there is little influence of the parasitic capacitance 404, TFT11f is continuously used by an OFF state. The screen size of a display panel is large, and when influence of the parasitic capacitance 404 cannot be solved only in operation of TFT11a, the gate signal line 17c is short-circuited with the logic of the gate signal line 17a, and it drives by realizing the pixel configuration of drawing 75.

[0515]The circuit block which drives the pixel configuration of drawing 82 is shown in drawing 84. The shift register 22c which drives the gate signal line 17c is formed, and the gate signal line 17c is driven. When driving by the pixel configuration of drawing 1, the data of ST3 is continuously set to L, and to the gate signal line 17c, it controls continuously so that the voltage of Vgh is outputted. What is necessary is just to make the same the data input states (timing, logic, etc.) of the shift registers 22c and 22a, when using it with the composition of drawing 82.

[0516]The composition of drawing 82 can also realize composition of a current mirror. The pixel configuration is shown in drawing 83. What is necessary is just to control by TFT11a1 divided and potential (V_{gh} or V_{hl}) which impresses whether TFT11n is operated as an object for driving current improvement to the gate signal line 17c to illustrate to drawing 83. If TFT11f is made into an OFF state, as for the current which flows into the source signal line 18, only the TFT11a will operate.

[0517]Drawing 82 is the point of having connected the gate terminal of switching TFT11f to the gate signal line 17c. That is, the on-off state of TFT11f is not influenced by the potential state of the gate signal line 17a, but it is in the point that original control is realizable.

[0518]TFT11f of TFT11n is in the state separated from the pixel in an OFF state continuously. If the gate signal line 17c and the gate signal line 17a are used short-circuiting in logic, it will become the composition of drawing 75.

[0519]Therefore, when the screen size of a display panel is small and there is little influence of the parasitic capacitance 404 like the pixel configuration of drawing 82, TFT11f is continuously used by an OFF state. The screen size of a display panel is large, and when influence of the parasitic capacitance 404 cannot be solved only in operation of TFT11a, the gate signal line 17c is short-circuited with the logic of the gate signal line 17a, driving current is increased, and it drives. Also in the pixel configuration of drawing 83, the circuit block of drawing 84 is applicable.

[0520]The shift register 22c which controls the gate signal line 17c by composition of drawing 84 was formed newly, and was operated. However, it does not limit to this composition. The control logic of the gate signal line 17c is easy. It is because V_{gl} or V_{gh} voltage is only impressed to the gate terminal of switching TFT11f. What is necessary is just to impress V_{hg} voltage to the

gate terminal of all the TFT11f in the viewing area 21, when not operating TFT11n. What is necessary is just to impress the potential of the gate signal line 17a to the gate signal line 17c, when operating TFT11n. Therefore, it is not necessary to use the shift register 22c separately like drawing 84. That is, it is because what is necessary is just to add a gate circuit so that the data of the shift register 22a may be outputted to the gate signal line 17c as it is or the potential of all the gate signal lines 17c may serve as V_{gh} .

[0521]The drive method of this invention is explained below. By increasing the current sent through the source signal line 18 N times, the influence of the parasitic capacitance 404 is lost and good image display with resolution can be realized.

[0522]Drawing 87 is an explanatory view of other examples which increase the current which flows into a source signal line. It is a method which chooses two or more pixel rows simultaneously fundamentally, carries out the charge and discharge of the parasitic capacitance of a source signal line, etc. with the current with which two or more pixel rows were united, and improves current writing shortage substantially. However, since two or more pixel rows are chosen simultaneously, the current which per pixel drives can be decreased. Therefore, the current which flows into EL element 15 can be decreased. Here, in order to explain easily, it explains as $N=10$ as an example (the current sent through a source signal line is increased 10 times).

[0523]As for this invention explained by drawing 87 etc., a pixel row chooses K pixel row simultaneously. From a source drivers IC, the N time current of predetermined current is impressed to the source signal line 18. N/K twice as many current as the current sent through an EL element is programmed by each pixel. In order to make an EL element into predetermined light emitting luminance, time to flow into an EL element is made into the K/N time of one frame. By driving in this way, the charge and discharge of the parasitic capacitance of the source signal line 18 can fully be carried out, and predetermined light emitting luminance can be obtained for good resolution.

[0524]That is, during the period of K/N of one frame sends current through an EL element, and other periods ($1F(N-1)K/N$) do not send current. In this displaying condition, an image data display and a black display (astigmatism light) are repeatedly displayed for every F. That is, an image data displaying condition will be in a discontinuous display (intermittent display) state in time. Therefore, outline dotage of a picture is lost and good animation display can be realized. Since it drives with N times as much current to the source signal line 18, influence of parasitic capacitance is not received but it can respond also to a high definition display panel.

[0525]First, in order to understand easily, one pixel row explained above is chosen, and the method which programs N times as much current is explained, referring to a driving waveform etc. Drawing 134 is the explanatory view. Although the screen is illustrated oblong with the explanatory view, it may not limit to this, and it may be longwise, and other shape, such as a round shape, may be sufficient.

[0526]Drawing 134 (a) is illustrating the writing state to the display image 21. In Drawing 134 (a), 871 is a write-in pixel row. The number of the pixel rows written in 1H period in Drawing 134 (a) is one. Although the pixel configuration of drawing 1 is mentioned as an example in the following examples and being explained, it may not be limiting to this, either, but it may be a pixel configuration of current mirrors, such as drawing 21, drawing 43, and drawing 71. It cannot be overemphasized that it is applicable also to the pixel configuration of voltage program methods, such as drawing 54, drawing 67, drawing 68, and Drawing 103.

[0527]In Drawing 134 (a), if the gate signal line 17a is chosen, the current which flows into the source signal line 18 will be programmed by TFT11a. At this time, OFF state voltage is impressed and current does not flow through the gate signal line 17b into EL element 15. It is because this has a capacity component of EL element 15 visible to the EL element side from the source signal line 18 in TFT11d being an ON state, it is influenced by this capacity and current programming exact enough becomes impossible to the capacitor 19. Therefore, the pixel row in which current is written as shown in Drawing 134 (b) will be in the astigmatism light state 312. TFT11d of other pixel rows is an ON state, and is the lighted condition 311. In the pixel configuration of the current mirror shown in drawing 21, drawing 43, drawing 71, etc., even if it is in the state where current flows into TFT11a which performs current programming, from the source signal line 18, EL element 15 is not visible. Therefore, as shown in Drawing 134 (b), it is not necessary to change into an astigmatism light state. That is, it is not an indispensable condition of an invention to write in, as shown in Drawing 134 (b), and to use a pixel row as the astigmatism light 312.

[0528]Drawing 135 shows the voltage waveform impressed to the gate signal line 17. A voltage waveform sets OFF state voltage to V_{gh} (H level), and is setting ON state voltage to V_{gl} (L level). The number of the pixel row chosen as the lower berth of Drawing 135 is indicated. (1) and (2) show the chosen pixel row number.

[0529]In Drawing 135, the gate signal line 17a (1) is chosen (V_{gl} voltage), and program current flows into the source signal line 18 toward the source driver 14 from TFT11a of the selected pixel row. This program current is N times (in order to explain easily, it explains as $N=10$.) of a predetermined value. Of course, since predetermined values are data currents which display a picture, unless it is a white raster display etc., they are not a fixed value. It is. Therefore, it is programmed by the capacitor 19 so that current flows 10 times at TFT11a. When the pixel row (1) is chosen, in the pixel configuration of drawing 1, OFF state voltage (V_{gh}) is impressed and current does not flow through the gate signal line 17b (1) into EL element 15.

[0530]After 1H, the gate signal line 17a (2) is chosen (V_{gl} voltage), and program current flows into the source signal line 18 toward the source driver 14 from TFT11a of the selected pixel row. This program current is N times (in order to explain easily, it explains as $N=10$) the predetermined value. Therefore, it is programmed by the capacitor 19 so that current flows 10 times at TFT11a. When the pixel row (2) is chosen, in the pixel configuration of drawing 1, OFF state voltage (V_{gh}) is impressed and current does not flow through the gate signal line 17b (2) into EL element 15. However, since OFF state voltage (V_{gh}) is impressed to the gate signal line 17a (1) of a previous pixel row (1) and ON state voltage (V_{gl}) is impressed to the gate signal line 17b (1), it is a lighted condition.

[0531]After the following 1H, the gate signal line 17a (3) is chosen, OFF state voltage (V_{gh}) is impressed and current does not flow through the gate signal line 17b (3) into EL element 15 of a pixel row (3). However, since OFF state voltage (V_{gh}) is impressed to the gate signal line 17a (1) and (2) of a previous pixel row (1) and (2) and ON state voltage (V_{gl}) is impressed to the gate signal line 17b (1) and (2), it is a lighted condition.

[0532]Synchronizing with the synchronized signal of 1H, the picture is displayed for the above operation. However, 10 times as much current flows into EL element 15 in the drive system of Drawing 135. Therefore, the display screen 21 is displayed by one about 10 times the luminosity of this. Of course, in order to perform a predetermined luminosity display in this state, it cannot be

overemphasized that what is necessary is just to make program current into $1/10$. However, since writing shortage will occur with parasitic capacitance etc. if it is $1/10$ of current, the fundamental main point of this invention programs with high current, and obtains predetermined luminosity by black picture 312 insertion.

[0533]However, the method of Drawing 134 is also a category of this invention. That is, it is the concept that it is made for current higher than predetermined current to flow into EL element 15, and it fully carries out the charge and discharge of the parasitic capacitance of the source signal line 18. That is, it is not necessary to send N times as much current through EL element 15. For example, a current route is formed in parallel with EL element 15, it may shunt that a dummy EL element is formed, this EL element forms a light-shielding film, and light is not made (emit) toward a straw-man EL element and EL element 15, and they may send current. [it] For example, when signal current is $0.2\mu\text{A}$, program current is set to $2.2\mu\text{A}$ and $2.2\mu\text{A}$ is passed to TFT11a. $0.2\mu\text{A}$ of signal current A is sent through EL element 15 among this current, and $2\mu\text{A}$ is passed to a dummy EL element.

[0534]by constituting as mentioned above, N times as much current flows into drive TFT11a by making the current sent through the source signal line 18 increase by N times -- as -- the current sufficiently smaller programmable than N times to current EL element 15 -- ***** -- things will be made. without it forms the astigmatism light field 312 in the above method so that it may illustrate to Drawing 136 etc. -- Drawing 134 -- like -- almost -- or all the viewing areas 21 can be thoroughly made into the image display region 311.

[0535]However, if workmanship of forming a straw-man EL element etc. is not carried out, the programmed current flows into EL element 15 theoretically [all]. Therefore, in Drawing 134, a display screen emits light by one N times the luminosity of this. What is necessary is just to form the astigmatism light viewing area 312 so that this may be illustrated to Drawing 136 making light emit by predetermined luminosity. Drawing 136 is an explanatory view of the method.

[0536]Drawing 136 (a) is illustrating the writing state to the display image 21. In Drawing 136 (a), 871a is a write-in pixel row. Program current is supplied to each source signal line 18 from the driver IC 14. The number of the pixel rows written in 1H period in Drawing 136 is one. However, not a limiting [to 1H]-in any way thing but 0.5H period or 2H period may be sufficient. Although program current is written in the source signal line 18, this invention is not limited to a current programming method, and the voltage program method which is voltage may be written in the source signal line 18.

[0537]In Drawing 136 (a), like Drawing 134, if the gate signal line 17a is chosen, the current which flows into the source signal line 18 will be programmed by TFT11a. At this time, OFF state voltage is impressed and current does not flow through the gate signal line 17b into EL element 15. It is because this has a capacity component of EL element 15 visible to the EL element side from the source signal line 18 in TFT11d being an ON state, it is influenced by this capacity and current programming exact enough becomes impossible to the capacitor 19. Therefore, if composition of drawing 1 is made into an example, the pixel row in which current is written as shown in Drawing 136 (b) will serve as the astigmatism light field 312.

[0538]If programmed now with twice [N (here, as stated previously, referred to as $N=10$)] as many current as this, the luminosity of a screen increases 10 times. Therefore, what is necessary is just to let 90% of range of the viewing area 21 be the astigmatism light field 312. Therefore, what is necessary is to consider it as 22 and the viewing area 311, and just to $220-22=198$ make it into the non display regions 312, if it is considered as 220 horizontal scanning lines of QCIF of an image display region ($S=220$). If it generally states and a horizontal scanning line (the number of pixel rows) will be set to S, the field of S/N will be made into the viewing area 311, and this viewing area 311 will be made to emit light by one N times the luminosity of this. And this viewing area 311 is scanned to the sliding direction of a screen. Therefore, let the field of $S(N-1)/N$ be the astigmatism light field 312. This astigmatism light field is a black display (nonluminescent). This nonluminescent part 312 is realized by making TFT11d turn off. Although it used making the light switch on by one N times the luminosity of this, it cannot be overemphasized that it adjusts with one N times the value of this by lightness adjustment and gamma adjustment with a natural thing.

[0539]In the previous example, if programmed with 10 times as much current, the luminosity of the screen increased 10 times and presupposed that what is necessary is just to make 90% of range of the viewing area 21 into the astigmatism light field 312. However, this does not limit the pixel of RGB to considering it as the astigmatism light field 312 in common. For example, the pixel of R may make one eighth the astigmatism light field 312, the pixel of G may make one sixth the astigmatism light field 312, and the pixel of B may change $1/10$ in the astigmatism light field 312 and each color. It may enable it to adjust the astigmatism light field 312 (or lighting field 311) individually by the color of RGB. In order to realize these, the individual gate signal line 17b is needed by R, G, and B. However, by enabling individual adjustment of the above RGB, it becomes possible to adjust a white balance and the balance adjustment of a color becomes easy in each gradation.

[0540]A pixel row including the write-in pixel row 871a considers it as the astigmatism light field 312 so that it may illustrate to Drawing 136 (b). Let the range of S/N of an upper screen be the viewing area 311 rather than the write-in pixel row 871a (when a write-in scan scans a screen upwards from the bottom in a down case, it serves as the reverse from on a screen). The viewing area 311 becomes band-like and moves an image display state downward from on a screen.

[0541]Drawing 137 shows the voltage waveform impressed to the gate signal line 17. A voltage waveform sets OFF state voltage to V_{gh} (H level), and is setting ON state voltage to V_{gl} (L level). The number of the pixel row chosen as the lower berth of Drawing 137 is indicated. (1), (2), (3) -- The pixel row number chosen with -- is shown.

[0542]In Drawing 137, the gate signal line 17a (1) is chosen (V_{gl} voltage), and program current flows into the source signal line 18 toward the source driver 14 from TFT11a of the selected pixel row. This program current is N times (in order to explain easily, it explains as $N=10$.) of a predetermined value. Of course, since predetermined values are data currents which display a picture, unless it is a white raster display etc., they are not a fixed value. It is.

[0543]Therefore, it is programmed by the capacitor 19 so that current flows 10 times at TFT11a. When the pixel row (1) is chosen, in the pixel configuration of drawing 1, OFF state voltage (V_{gh}) is impressed and current does not flow through the gate signal line 17b (1) into EL element 15.

[0544]1H (of course, it does not limit to 1H.) It is for explaining easily. Behind, the gate signal line 17a (2) is chosen (V_{gl} voltage), and program current flows into the source signal line 18 toward the source driver 14 from TFT11a of the selected pixel row. This program current is N times (in order to explain easily, it explains as $N=10$) the predetermined value. Therefore, it is programmed by the capacitor 19 so that current flows 10 times at TFT11a. As for the gate signal line 17b (1), V_{gl} voltage (ON state voltage) is impressed at this time. According to the example of Drawing 136, the period when this ON state voltage is impressed is a

period of S/N. Then, V_{gh} (OFF state voltage) is impressed and current does not flow through the gate signal line 17b (1) into EL element 15 of a pixel row (1).

[0545]When the pixel row (2) is chosen, in the pixel configuration of drawing 1, OFF state voltage (V_{gh}) is impressed and current does not flow through the gate signal line 17b (2) into EL element 15. However, since OFF state voltage (V_{gh}) is impressed to the gate signal line 17a (1) of a previous pixel row (1) and ON state voltage (V_{gl}) is impressed to the gate signal line 17b (1), it is a lighted condition. According to the example of Drawing 136, the period when this ON state voltage is impressed is a period of S/N. Then, V_{gh} (OFF state voltage) is impressed and current does not flow through the gate signal line 17b (2) into EL element 15 of a pixel row (2).

[0546]After the following 1H, the gate signal line 17a (3) is chosen, OFF state voltage (V_{gh}) is impressed and current does not flow through the gate signal line 17b (3) into EL element 15 of a pixel row (3). However, since OFF state voltage (V_{gh}) is impressed to the gate signal line 17a (1) and (2) of a previous pixel row (1) and (2) and ON state voltage (V_{gl}) is impressed to the gate signal line 17b (1) and (2), it is a lighted condition. The above operation is repeated and the displaying condition of Drawing 136 is realized.

[0547]In the display of Drawing 136, the one viewing area 311 moves to down from on a screen. If a frame rate is low, it will be recognized visually that the viewing area 311 moves. It becomes that it is easy to be recognized when a palpebra is closed especially, or when moving a face up and down.

[0548]It is good to divide the viewing area 311 into plurality so that it may illustrate to Drawing 138 to this technical problem. Drawing 138 (b) is dividing the non display regions 312 into five. If the portion which added these five serves as area of S (N-1)/N, it will become equivalent to the luminosity of Drawing 136. Conversely, if it sees from the viewing area 311, the viewing area (lighting field) 311 will be divided into six, but if it constitutes so that the portion which added the field divided into these six may be abbreviated-in agreement with S/N (drive), it will become equivalent to the display luminance of Drawing 136.

[0549]It is not necessary to make equal the divided viewing area 311 so that it may illustrate to Drawing 138 (b). It is not necessary to also make equal the divided non display regions 312.

[0550]As mentioned above, a flicker of a screen decreases by dividing the viewing area 311 into plurality. Therefore, there is no generating of a flicker and good image display can be realized. Division may be made finer. However, the more it divides, the more animation display performance falls.

[0551]Drawing 139 shows the voltage waveform impressed to the gate signal line 17. The difference between Drawing 139 and Drawing 137 is operation of the gate signal line 17b. The gate signal line 17b carries out on-off (V_{gl} and V_{gh}) operation by the number corresponding to the number which divides a screen. Since other points are the same as that of Drawing 137, explanation is omitted.

[0552]In the above example, the pixel row chosen simultaneously was one pixel row. Drawing 88 is the method of choosing two or more pixel line simultaneously. By drawing 88, to explain choosing simultaneously with five pixel rows, in order to explain easily, but it is not limiting to this, either and what is necessary is just 2 pixels or more. However, an increase of the pixel row chosen simultaneously will reduce the variation absorption effect of drive TFT11a.

[0553]Although explained by illustrating the pixel configuration of the current programming of drawing 1 also in the following examples, it does not limit to this. It cannot be overemphasized that it is effective also at the current mirror of drawing 21, drawing 43, and drawing 71. By [which the pixel row chosen simultaneously sets] becoming, it is because charges and discharges, such as the parasitic capacitance 404 of a source signal line, become easy. The pixel configuration of voltage programs, such as drawing 54, drawing 67, drawing 68, and Drawing 103, is also effective. When the pixel row chosen simultaneously increases, it is because the preliminary charging of the pixel row which adjoined can be carried out and it can respond also to a high definition display panel.

[0554]Current sent through the source signal line 18 from the source drivers IC 14 also here in order to explain easily (or) The current which the source drivers IC 14 absorbs from the source signal line 18, and the current which drive TFT11a slashes into the source signal line 18 explain as 10 times (N= 10) of a predetermined value.

[0555]Therefore, if the pixel rows chosen simultaneously are five pixel rows (K= 5), the five drive TFT11a will operate. That is, 10 per pixel / 5= 2 twice as many current as this flows into TFT11a. If the pixel rows chosen simultaneously are two pixel rows, the two drive TFT11a will operate. That is, 10 per pixel / 2= 5 times as many current flows into TFT11a.

[0556]If the pixel rows chosen simultaneously are five pixel rows (K= 5), it will become what added five program current of TFT11a. For example, the current of I_{dx10} will be sent through the source signal line 18, if it is originally considered as the current I_d to write in and is referred to as N= 10 at the write-in pixel row 871a. The write-in pixel row 871a and the pixel row 871b (871b is a pixel row used auxiliary in order to make the current amount to the source signal line 18 increase.) which adjoined Therefore, the pixel (line) which writes in a picture is 871a, and in order to write in 871a, 871b uses [a pixel (line)] auxiliary.

[0557]Ideally, 5-pixel TFT11a sends the current of I_{dx2} through the source signal line 18, respectively. And twice as many current as this is programmed by the capacitor 19 of each pixel 16. However, actually, since the characteristic has shifted, variation generates each 5-pixel TFT11 on the current programmed by the capacitor 19 of each pixel. For example, 2.2 times, 2.0 times, 1.6 times, and 2.4 times as much current is programmed by 1.8 times and the four pixels (line) 871b at the pixel (line) 871a. 1.8 times as much current is programmed by the write-in pixel row 871a in this example. Therefore, (2.0-1.8) / 2.0= 10% of error comes out. However, the current adding these is maintained at 10 times and default value.

[0558]That is, the current programmed from the source driver 14 flows into the source signal line 18 as regulation. However, the current to which characteristic variation responded flows into the selected pixel. Therefore, target program current shifts from a preset value, so that the characteristic variation of TFT11a of each pixel is large. However, since the characteristic of adjoining TFT11a corresponds mostly, even if it makes the pixel row simultaneously chosen like drawing 88 increase, it can realize a uniform display.

[0559]Examples, such as drawing 87 and drawing 88, are effective in the display panel which formed TFT11 with low-temperature-polysilicon art, and formed TFT11 with amorphous silicon art rather than the display panel. In TFT11 of an amorphous silicon, it is because the characteristic of adjoining TFT is mostly in agreement. Therefore, even if it drives with the added current, the driving current of each TFT serves as a desired value mostly.

[0560]In drawing 88, K lines ($K=5$) are simultaneously written in by the image data of the write-in pixel (line) 871a. Therefore, the range of K line (871a, 871b) serves as the same display. Thus, if the same display is used, resolution will fall with a natural thing. In order to cope with this, it writes in so that it may illustrate to drawing 88 (b), and the portion of the pixel row 871 is considered as the astigmatism light display 312. Therefore, resolution lowering is not generated.

[0561]After the following 1H writes in the position which carried out 1 pixel-row shift, and performs the same operation as the pixel row 871a. The 1-pixel (line) shift also of the astigmatism light field 312 is carried out. Therefore, the pixel (line) by which current programming was carried out by 1H of the point is displayed.

[0562]As mentioned above, 871b in which different current data from an original indicative data was written is not displayed. If it shifts the above operation of one line at a time, perfect image display is realizable. The charge and discharge of the parasitic capacitance 404 are also realizable within 1H period enough by the effect of the pixel row 871b of using auxiliary.

[0563]Drawing 140 is an explanatory view of the driving waveform for realizing the drive method of drawing 88. Like Drawing 135, a voltage waveform sets OFF state voltage to V_{gh} (H level), and is setting ON state voltage to V_{gl} (L level). The number of the pixel row chosen as the lower berth of Drawing 140 is indicated. (1), (2), (3) ... (6) shows the chosen pixel row number. Therefore, in the case of a QCIF display panel, it is 220, and the number of lines is 480 by the VGA panel.

[0564]In Drawing 140, the gate signal line 17a (1) is chosen (V_{gl} voltage), and program current flows into the source signal line 18 toward the source driver 14 from TFT11a of the selected pixel row. Here, in order to explain easily, it explains first that the write-in pixel row 871a is eye pixel row (1) watch.

[0565]The program current which flows into the source signal line 18 is N times (in order to explain easily, it explains as $N=10$) of a predetermined value. Of course, since predetermined values are data currents which display a picture, unless it is a white raster display etc., they are not a fixed value. It is. Five pixel rows explain as selection ($K=5$) simultaneously. Therefore, ideally, it is programmed by the capacitor 19 of one pixel so that current flows twice at TFT11a.

[0566]When a write-in pixel row is (1) pixel-row eye, as Drawing 140 illustrated, as for the gate signal line 17a, (1), (2), (3), (4), and (5) are chosen. That is, switching TFT11b of a pixel row (1), (2), (3), (4), and (5) and TFT11c are ON states. The gate signal line 17b serves as an opposite phase of the gate signal line 17a. Therefore, switching TFT11d of a pixel row (1), (2), (3), (4), and (5) is an OFF state, and current is not flowing into corresponding EL element 15 of a pixel row. That is, it is in the astigmatism light state 312.

[0567]Ideally, 5-pixel TFT11a sends the current of I_{dx2} through the source signal line 18, respectively. And twice as many current as this is programmed by the capacitor 19 of each pixel 16. Here, in order to understand easily, it explains noting that the characteristic (V_t , S value) of each TFT11a corresponds.

[0568]Since the pixel rows chosen simultaneously are five pixel rows ($K=5$), the five drive TFT11a operates. That is, 10 per pixel / $5=2$ twice as many current as this flows into TFT11a. The current which added five program current of TFT11a flows into the source signal line 18. For example, it is considered as the current I_d originally written in the write-in pixel row 871a, and the current of I_{dx10} is sent through the source signal line 18. In order to make the current amount to the write-in pixel row 871b source signal line 18 which writes in image data henceforth increase from a write-in pixel row (1), it is a pixel row used auxiliary. However, since behind regular image data is written in, the write-in pixel row 871b is satisfactory.

[0569]Therefore, the pixel row 871b is the same display as 871a between 1H periods. Therefore, the pixel row 871b chosen in order to make the write-in pixel row 871a and current increase is changed at least into the non-display state 312. However, in the pixel configuration of voltage program methods, such as drawing 21, drawing 43, a pixel configuration of a current mirror like drawing 71, and drawing 68, it is good also as a displaying condition depending on the case.

[0570]After the following 1H, the gate signal line 17a (1) serves as non selection, and ON state voltage (V_{gl}) is impressed to the gate signal line 17b. Simultaneously, the gate signal line 17a (6) is chosen (V_{gl} voltage), and program current flows into the source signal line 18 toward the source driver 14 from TFT11a of the selected pixel row (6). Regular image data is held from that of operating in this way at a pixel row (1).

[0571]After the following 1H, the gate signal line 17a (2) serves as non selection, and ON state voltage (V_{gl}) is impressed to the gate signal line 17b. Simultaneously, the gate signal line 17a (7) is chosen (V_{gl} voltage), and program current flows into the source signal line 18 toward the source driver 14 from TFT11a of the selected pixel row (7). Regular image data is held from that of operating in this way at a pixel row (2). One screen is rewritten by scanning, shifting one pixel row at a time with the above operation.

[0572]Although it is the same as that of Drawing 134, in order to program with twice as many current (voltage) as this to each pixel, by the drive method of Drawing 140, the light emitting luminance of EL element 15 of each pixel will be twice ideally. Therefore, the luminosity of a display screen will be twice rather than a predetermined value.

[0573]What is necessary is just to let one half of the ranges of the viewing area 21 be the non display regions 312, including the write-in pixel row 871 so that you may illustrate to drawing 87 in order to make this into predetermined luminosity. Since this was explained using Drawing 137 etc., it omits explanation.

[0574]Animation display performance improves, so that area of the black display area (non display regions) 312 occupied to the display screen 21 is enlarged. Therefore, what is necessary is to lessen the non display regions 311 so that it may illustrate to Drawing 141, and just to enlarge area of the non display regions 312.

[0575]Like drawing 87, the current programmed to each pixel can obtain predetermined display luminance, if the area of the lighting field 311 is $1/2$ of the display screen 21 in twice. However, as shown in Drawing 141, a screen becomes dark when the lighting field 311 is smaller than one half of the display screens 21. What is necessary is just to enlarge the current programmed to each pixel, in order to obtain predetermined luminosity. For example, what is necessary is for the viewing area (lighting field) 311 to be $1/5$ of the area of the display screen 21, and just to increase the current (voltage) programmed to one pixel row 5 times of a predetermined value, if the number of the pixel rows chosen simultaneously is five ($K=5$). The current which flows into the source signal line 18 will be 5×5 pixel-row = 25 time.

[0576]Anyway, in the example of this invention, program current (voltage) can be adjusted by changing the current (voltage) sent through the source signal line 18. That is, the current which flows into the source signal line 18 can be adjusted only by adjusting the reference current (voltage) of the source driver 14. It can be set up by the data to ST* terminal impressed to the shift register 22 of the gate driver 12 illustrated to drawing 2 etc. whether five pixel rows are made whether two pixel rows are made

one simultaneously or one simultaneously or only one pixel row is chosen. Therefore, the specification of the source driver 14 is not influenced by the pixel number to choose. Since the luminosity of a screen can also be adjusted by turning on and off of the gate signal line 17b, the output current from the source driver 14 is not changed by the lightness adjustment of Screen 21. Therefore, what is necessary is just to determine the gamma characteristic of EL element 15 to one current. Therefore, the composition of the source driver 14 is very easy, and becomes a high thing of flexibility. It cannot be overemphasized that the above matter is applicable also to the example of other this inventions.

[0577]The above example was composition which arranges one selected picture element line for every pixel row (formation). This invention may not be limited to this and may arrange one selector-gate signal wire by two or more pixel rows (formation).

[0578]Drawing 294 shows the example. In order to explain easily, a pixel configuration explains by mainly illustrating the case of drawing 1. In Drawing 294, the selector-gate signal wire 17a of a pixel row chooses simultaneously three pixels (16R, 16G, 16B). The sign of R shall mean red pixel relation, the sign of G shall mean green pixel relation, and the sign of B shall mean blue pixel relation.

[0579]Therefore, the pixel 16R, the pixel 16G, and the pixel 16B are simultaneously chosen by selection of the gate signal line 17a, and will be in a data writing state by it. The pixel 16R writes data in the capacitor 19R from the source signal line 18R, and the pixel 16G writes data in the capacitor 19G from the source signal line 18G. The pixel 16B writes data in the capacitor 19B from the source signal line 18B.

[0580]TFT11d of the pixel 16R is connected to gate signal line 17bR. TFT11d of the pixel 16G is connected to gate signal line 17bG, and TFT11d of the pixel 16B is connected to gate signal line 17bB. Therefore, on-off control of EL element 15R of the pixel 16R, EL element 15G of the pixel 16G, and EL element 15B of the pixel 16B can be carried out separately. That is, EL element 15R, EL element 15G, and EL element 15B are individually controllable in lighting times and a lighting cycle by controlling each gate signal line 17bR, 17bG, and 17bB.

[0581]The shift register 22 which scans the gate signal line 17a in the composition of drawing 2 in order to realize this operation. It is appropriate to form four, the shift register 22 which scans gate signal line 17bR, the shift register 22 which scans gate signal line 17bG, and the shift register 22 which scans gate signal line 17bB, (arrangement).

[0582]Drawing 295 is illustrating arrangement of the pixel 16. In Drawing 295, the pixel is formed in the shape of horizontal SUTORAIBU (in the still more conventional composition, it is generally vertical stripe shape). By arranging a pixel to horizontal stripe shape, connection between the gate signal line 17 and the switching element 11 becomes easy, and a pixel layout also becomes easy. In the EL element of a polymer material, production by an ink jet also becomes easy.

[0583]Although it presupposed that a pixel is formed in the shape of horizontal SUTORAIBU with Drawing 294 and Drawing 295, it cannot be overemphasized that it may be vertical stripe shape as usual. The reverse-bias-voltage impression method which explains henceforth or explained, The composition which makes separate voltage of a block drive system, the control system in Vbb voltage, and each RGB, It cannot be overemphasized that it is appropriate to combine with other examples which were described in these specifications, such as composition which adds the method, the method of Drawing 241, and straw-man pixel row which TFT11b runs and use voltage.

[0584]Drawing 296 shows the waveform of the pixel configuration of Drawing 294 of operation. In order to explain easily, it explains noting that one pixel row (it will be called three pixel rows, of course if it counts by RGB) is chosen. However, it cannot be overemphasized that the drive method which chooses two or more pixel rows simultaneously as drawing 87, drawing 88, Drawing 142, etc. explained is also realizable. As Drawing 252 explained, even if it is the range of 1H period, it is necessary to perform timing control of a gate signal line but, and in order to explain easily here, selection of the pixel row by the gate signal line 17a explains noting that it is 1H period. The above matter is applied also in other drive methods explained in this specification, and panel structure.

[0585]In Drawing 296, when a write-in pixel row is (1) pixel-row eye, pixel 16 Plock (as for an understanding, the direction which considers this to be one pixel row becomes easy) has chosen the gate signal line 17a (Drawing 294 is also set and it is a thing of reference). That is, the pixel 16R, the pixel 16G, and pixel 16B are chosen. Therefore, 16G of 16R of a pixel row (1) and a pixel row (1) and switching TFT11b of 16B of a pixel row (1), and TFT11c are ON states.

[0586]The pixel 16R of a pixel row (1) writes the image data from the source signal line 18R in the capacitor 19R. The pixel 16G of a pixel row (1) writes the image data from the source signal line 18G in the capacitor 19G, and the pixel 16B of a pixel row (1) writes the image data from the source signal line 18B in the capacitor 19B.

[0587]In order to explain easily, it supposes that it programs to each pixel so that N times ($N=2$) as much current flows into EL element 15, and Drawing 296 explains noting that current flows into EL element 15 during [of one frame (1 field)] the $1/N$. However, it cannot be overemphasized that other examples may be carried out as this specification explains. It cannot be overemphasized by enlarging N-ary that the influence of the parasitic capacitance 404 of the source signal line 18 can be disregarded now, and it becomes easy to write image data in the pixel 16. That is, it does not limit to $N=2$. It cannot be overemphasized that N is not limited to an integer and it can realize also with values, such as 2.5. The selection time of the gate signal line 17a may not be limited to 1H, either, and more than 2H may be sufficient as it.

[0588]Gate signal line 17bR, gate signal line 17bG, and gate signal line 17bB of the pixel row (1) serve as an opposite phase of the gate signal line 17a. Therefore, switching TFT11d of the pixel 16R of a pixel row (1), the pixel 16G, and the pixel 16B is an OFF state at least, and current is not flowing into the corresponding EL element (15R, 15G, 15B) of a pixel row. That is, it is in the astigmatism light state 312.

[0589]After the following 1H, the gate signal line 17a (1) serves as non selection, and ON state voltage (Vgl) is impressed to the gate signal line 17b. The gate signal line 17a (2) is chosen simultaneously (Vgl voltage), Program current flows into the source signal line 18 (respectively 18R, 18G, 18B) toward the source driver 14 from TFT11a of the pixel 16R of the selected pixel row (2), the pixel 16G, and the pixel 16B. By operating in this way, image data is held at the pixel 16R, the pixel 16G, and the pixel 16B of a pixel row (1).

[0590]Furthermore, after the following 1H, the gate signal line 17a (2) serves as non selection, and ON state voltage (Vgl) is impressed to the gate signal line 17b (2). Simultaneously, the gate signal line 17a (3) is chosen (Vgl voltage), and program current flows into the source signal line 18 toward the source driver 14 from TFT11a of the selected pixel row (3). From that of operating in this way, image data is held at a pixel row (2). One screen is rewritten by scanning shifting one pixel row of the

above operation at a time.

[0591]Next, operation of the gate signal line 17b of Drawing 296 is mainly explained. Gate signal line 17bR is connected to the pixel 16R. Gate signal line 17bG is connected to the pixel 16G. Gate signal line 17bB is connected to the pixel 16B. Therefore, the pixel 16R can carry out on-off control of the current which flows into EL element 15R by gate signal line 17bR. Similarly, the pixel 16G can carry out on-off control of the current which flows into EL element 15G by gate signal line 17bG, and the pixel 16B can carry out on-off control of the current which flows into EL element 15B by gate signal line 17bB.

[0592]In Drawing 296, gate signal line 17bR, gate signal line 17bG, and gate signal line 17bB are made into the same waveform in each pixel row. Therefore, EL elements 15R, 15G, and 15B are simultaneously turned on and off (lighting, astigmatism light).

Although Drawing 296 is making EL element 15 one [the EL element] and turn off every 4H, it is not limited to this. EveryH and more than it may be sufficient. EL element 15 may be made to turn on and off with the cycle not more than 1H theoretically.

[0593]However, if an on-off cycle is made too much quick, an animation Japanese quince will occur in animation display. Therefore, it is necessary to set an interval until one [the EL element /, and / EL element 15 goes out and] then to 0.5 or more msec. When this cycle was short, it will not be in a perfect black display state with the afterimage characteristic of human being's eyes, but a picture came to have faded, and resolution came to have fallen. It will be in the displaying condition of a data-hold type display panel. However, when an on-off cycle is set to 100 or more msec, it is visible to a flickering state. Therefore, the on-off cycle of the EL element should be made less than more than 0.5microsec100msec. The on-off cycle should be made still more preferably 30 or less msec of 2 or more msec. The on-off cycle should be made still more preferably 20 or less msec of 3 or more msec.

[0594]The number of insertion of the black picture 312 which makes a screen turn on and off is determined from the time which one frame (1 field) takes from the above relation, and the cycle or the number of times of the signal (Vgh, Vgl) impressed to the gate signal line 17b. If the black picture 312 is set to one, good animation display is realizable, but a flicker of a screen is in sight easily. Therefore, it is preferred to divide black 312 insert portion into plurality. However, if the number of partitions is made too much large, an animation Japanese quince will occur. The number of partitions should carry out to eight or less [1 or more]. Or more 1 thing to do to five or less is still more preferably preferred.

[0595]This invention turns off TFT11d, and even if it intercepts the current which flows into EL element 15, if one [this invention / TFT11d], it can send through EL element 15 again the same current as the current which was flowing previously. This is because the memory (analog memory) of the current value to pass is carried out to the capacitor 19 of the pixel. This matter is the big feature of this invention. That is, it is because control which makes the current sent through EL element 15 turn on and off can be freed.

[0596]In Drawing 296, gate signal line 17bR, gate signal line 17bG, and gate signal line 17bB are made into the same waveform in each pixel row. Selection of the pixel row is carrying out the cyst of the selected picture element line one by one for everyH. Therefore, the light-emitting position of EL elements 15R, 15G, and 15B is moved at high speed downward from on Screen 21. The insertion rate of this on-off control and the black picture 312 and the insertion number of the black picture 312 are easily realizable by controlling ST data to the shift register 22 explained by drawing 2 etc. Of course, it cannot be overemphasized that parallel control of the control of the Vgh data impressed to the gate signal line 17b may be carried out.

[0597]Although the signal impressed to the gate signal line 17 was made into the periodic signal, it may not be limited to this and an aperiodic signal may be sufficient as it. However, if total of time to one [the EL element] or turn off EL element 15 differs, the luminosity of a screen will change. A gap of color balance occurs. Therefore, in the period of one frame (1 field), it is necessary to make total of time to one [the EL element] or turn off EL element 15 into constant value. As a case of being special, total of time to one [the EL element] or turn off EL element 15 in the period more than two frame (2 field) is made into constant value. They are a case where one frame (field) is very a high speed, and a case of an FSC (frame sequential control) drive.

[0598]In Drawing 296, gate signal line 17bR, gate signal line 17bG, and gate signal line 17bB are made into the same waveform in each pixel row. Selection of the pixel row is carrying out the cyst of the selected picture element line one by one for everyH. In Drawing 297, the waveform impressed to gate signal line 17bR is changed 2H cycle, the waveform impressed to gate signal line 17bG is changed 3H cycle, and the waveform impressed to gate signal line 17bB is changed 4H cycle. Since other matters are the same as that of Drawing 296, explanation is omitted.

[0599]Although the waveform impressed to gate signal line 17bR was changed 2H cycle, the waveform impressed to gate signal line 17bG was changed 3H cycle and the waveform impressed to gate signal line 17bB carried out to making it change 4H cycle in Drawing 297, This is for drawing easily and is not limited to 2H, 3H, etc. At least, the signal wave form impressed to the one or more gate signal lines 17b among gate signal line 16bB connected to the pixel 16B changes other gate signal lines 17b with gate signal line 16bR connected to the pixel 16R, and gate signal line 16bG connected to the pixel 16G.

[0600]If it drives as shown in Drawing 297, the light-emitting position of EL elements 15R, 15G, and 15B is moved at high speed downward from on Screen 21. Under the present circumstances, the on-off (lighting, astigmatism light) cycle of EL element 15R and the on-off (lighting, astigmatism light) cycle of EL element 15G differ from the on-off (lighting, astigmatism light) cycle of EL element 15B. Generating of a flicker becomes difficult to be conspicuous by changing the lighting cycle of EL element 15.

[0601]The insertion rate of this on-off control and the black picture 312 and the insertion number of the black picture 312 are easily realizable by controlling ST data to the shift register 22 explained by drawing 2 etc. Of course, it cannot be overemphasized that parallel control of the control of the signal (Vgh, Vgl) data impressed to the gate signal line 17b may be carried out.

[0602]In Drawing 298, the Vgl period impressed to gate signal line 17bR is made shorter than other gate signal lines 17b. Therefore, the lighting times of EL element 15R connected to gate signal line 17bR become long (the period [one / a period / TFT11d of the pixel 16R] becomes long). Therefore, the light emitting luminance of R of the display screen 21 becomes strong.

[0603]As mentioned above, the color balance of Screen 21 and generating of a flicker can be controlled by controlling individually the signal impressed to gate signal line 17bR, gate signal line 17bG, and gate signal line 17bB. That is, the color balance of Screen 21 and generating of a flicker can be controlled by controlling the time, the timing, and the cycle which make EL element 15 one.

[0604]Although the waveform impressed to gate signal line 17bG was changed 3H cycle and the waveform impressed to gate

signal line 17bB carried out to making it change 4H cycle in Drawing 298, this is for drawing easily and is not limited to 2H, 3H, etc. Gate signal line 16bR connected to the pixel 16R at least, and gate signal line 16bG connected to the pixel 16G, The applying time of the signal which makes TFT11d the one among the signal wave forms impressed to the one or more gate signal lines 17b among gate signal line 16bB connected to the pixel 16B (or it is made to turn off) changes other gate signal lines 17b. [0605]If it drives as shown in Drawing 298, the light-emitting position of EL elements 15R, 15G, and 15B is moved at high speed downward from on Screen 21. Under the present circumstances, the one (lighting) time of EL element 15R, the one (lighting) time of EL element 15G, and the one (lighting) time of EL element 15B can be changed. Therefore, the color balance adjustment of a screen becomes possible, and generating of a flicker becomes difficult to be conspicuous. As for such color balance adjustment, while a user sees Screen 21, constituting so that it can adjust is preferred. This adjustment is easy. It is because what is necessary is just to increase or decrease the one number of ST data inputted into the shift registers 22, such as drawing 2. The insertion rate of this on-off control and the black picture 312 and the insertion number of the black picture 312 are easily realizable by controlling ST data to the shift register 22 explained by drawing 2 etc. Of course, it cannot be overemphasized that parallel control of the control of the signal (Vgh, Vgl) data impressed to the gate signal line 17b may be carried out.

[0606]Drawing 298 illustrated by illustrating the case where a pixel configuration is drawing 1 from Drawing 294. However, it cannot be overemphasized that it is applicable even if the above examples are other pixel configurations. For example, they are drawing 21, drawing 43, drawing 71, drawing 22, drawing 54, drawing 68, Drawing 103, etc. That is, the technical idea explained with Drawing 298 is applicable also in other composition from Drawing 294. For example, Drawing 360 shows the example in the composition (refer to drawing 21, drawing 43, etc.) of a pixel of a current mirror. Drawing 361 shows the example of the pixel configuration of the voltage program illustrated by drawing 54 etc.

[0607]The drive method explained with drawing 88, drawing 87, Drawing 140, etc. was a drive system which chooses two or more pixel line simultaneously. In this drive system, cautions are required in respect of the following. If it says from a conclusion, it will be that what the pixel (line) (dummy pixels (line)) which does not contribute to a display is provided for (it forms) is preferred. The above reason etc. are explained below.

[0608]Drawing 246 is an explanatory view of the drive system which chooses two pixel rows simultaneously. In Drawing 246, the state where the pixels 16a and 16b are chosen is illustrated. TFT11a of the pixel 16a and TFT11a of the pixel 16b send the current Idd through the source signal line 18, respectively.

[0609]In order to explain easily here, the current which TFT11a of each pixel sends presupposes that there is no variation, and is made into $2 \times I_{dd} = I_w$. That is, the source driver circuit 14 absorbs the current I_w from the source signal line 18, and the current which divided this current I_w into two equally is programmed by the capacitor 19 which is each pixel. For example, it is $I_w = 30\text{nA}$ if it is $I_{dd} = 15\text{nA}$.

[0610]The two write-in pixel rows 871 (871a, 871b) are chosen, and it is chosen from the top chord of Screen 21 as the lower side one by one so that it may illustrate to Drawing 247 (a). However, as shown in Drawing 871 (b), if it comes to the lower side of a screen, it writes in and the pixel row 871a exists, but 871b is lost. That is, the pixel row only of one to choose is lost. Therefore, the current I_w impressed to the source signal line 18 is altogether written in the pixel row 871a. Therefore, it will be $I_w = I_{dd}$ and twice as many current as this will be programmed by the pixel as compared with the pixel row 871a of Drawing 247 (a).

[0611]To this technical problem, this invention forms the straw-man pixel row 2471 in the lower side of Screen 21 so that it may illustrate to Drawing 247 (b) (arrangement). Therefore, when a selected picture element line is chosen to the lower side of Screen 21, the last pixel row and the straw-man pixel row 2471 of Screen 21 are chosen. Therefore, the current of $I_{dd} = I_w/2$ as regulation is written in the write-in pixel row of Drawing 247 (b).

[0612]Drawing 248 shows the state of Drawing 247 (b). When a selected picture element line is chosen to the pixel 16b line of the lower side of Screen 21 with Drawing 248 so that clearly, the last pixel row 2471 of Screen 21 is chosen. The pixel row 2471 is formed so that it may illustrate to Drawing 249 (arrangement). However, the straw-man pixel row 2471 is arranged out of the viewing area 21. That is, the straw-man pixel row 2471 is constituted so that it may not be visible as a display, even if it switches on the light or it does not switch on the light, and it does not make the light switch on.

[0613]Even if it is the composition which forms the straw-man pixel row 2471 as shown in Drawing 248 and Drawing 249 (arrangement), it cannot be overemphasized that the gate signal line 17b etc. can be carried out in common by the light control line 1791 as Drawing 179 explained, and a block lighting drive can be carried out. It cannot be overemphasized that it is also combinable also with a reverse bias drive (refer to Drawing 250).

[0614]Drawing 247 -- the lower side of Screen 21 -- the dummy pixels (line) 2471 -- providing (it forms -- it arranges) -- although carried out, it does not limit to this. For example, when [which is scanned from the lower side of a screen to the top chord] carrying out (up-and-down inversion scan), the straw-man pixel row 2471 should be formed also in the top chord of Screen 21 so that it may illustrate to Drawing 251 (b), so that it may illustrate to Drawing 251 (a). That is, the straw-man pixel row 2471 is formed in each of the lower side for the top chord of Screen 21 (refer to Drawing 254). (arrangement) By constituting as mentioned above, it can respond now also to the flip vertical scan of a screen.

[0615]The above example was a case where simultaneous selection of the two pixel rows was made. This invention may not be limited to this and the method which makes simultaneous selection of the five pixel rows may be sufficient as it, for example.

[0616]Drawing 255 is an explanatory view of the drive method which chooses five pixel rows simultaneously. The straw-man pixel row 2471 for 4 pixels is formed the up-and-down neighborhood of a screen so that it may illustrate to Drawing 255.

[0617]Drawing 271 is an explanatory view of the drive method of the display panel of Drawing 255. From the source driver circuit 14, it explains that the current of $I_w = 5 \times I_{dd}$ outputs (or absorption). The current I_{dd} is current (current programmed) written in each pixel. It cannot be overemphasized that I_{dd} changes with display images.

[0618]In the drive system which chooses five pixel rows simultaneously, the source driver circuit 14 is outputted with 5 times as much current as the current I_{dd} written in a pixel. In Drawing 271 (a), only the pixel on No. 1 of Screen 21 is chosen. However, in this state, since it is $I_w = 5 \times I_{dd}$, 5 times as much current as a predetermined value will write in, and it will be written in the pixel row 871.

[0619]To this technical problem, by this invention, the straw-man pixel row 2471a of four pixel rows is simultaneously chosen so

that it may illustrate to Drawing 271 (a). That is, simultaneous selection of the four straw-man pixel rows 2471a and the write-in pixel row 871 of one viewing area is made. Therefore, since it is set to $I_w=5 \times I_{dd}$, the predetermined current I_{dd} is programmed by the pixel row 871 selected with Drawing 271 (a).

[0620]In Drawing 271 (b), the two write-in pixel rows 871 of the viewing area 21 are chosen, one is not chosen but, as for the straw-man pixel row 2471a, three are chosen. Therefore, the selected pixel row becomes a total of five. Therefore, since it is set to $I_w=5 \times I_{dd}$, the predetermined current I_{dd} is programmed by the two pixel rows 871 selected with Drawing 271 (b).

[0621]Similarly, in Drawing 271 (c), the three write-in pixel rows 871 of the viewing area 21 are chosen, two are not chosen but, as for the straw-man pixel row 2471a, two are chosen. Therefore, the selected pixel row becomes a total of five. Therefore, since it is set to $I_w=5 \times I_{dd}$, the predetermined current I_{dd} is programmed by the two pixel rows 871 selected with Drawing 271 (c).

[0622]As mentioned above, in Drawing 271 (d), the four write-in pixel rows 871 of the viewing area 21 are chosen, three are not chosen but, as for the straw-man pixel row 2471a, one is chosen. In Drawing 271 (e), the five write-in pixel rows 871 of the viewing area 21 are chosen, and the straw-man pixel row 2471a is not chosen. As mentioned above, five pixel rows are chosen one by one (Drawing 271 (f), (g), (h)). If it arrives at the lower side of Screen 21, the selection number of the straw-man pixel row 2471b will increase for everyH.

[0623]Since [the] a pixel row including the straw-man pixel row 2471 can be made into constant value when choosing the top chord or the lower side of Screen 21 even if the pixel row which makes simultaneous selection by driving as mentioned above increases. The current value which the source driver circuit 14 outputs is fixable the simultaneous selection pixel row twice of image data. Therefore, the composition of the source driver circuit 14 becomes easy, and target predetermined current (voltage) is written in each pixel.

[0624]As mentioned above, what is necessary is just to form $5-1=4$ straw-man pixel row in one side of a screen in the drive system which chooses five pixel rows simultaneously. That is, what is necessary is just to form or arrange the straw-man pixel row more than the book (number of pixel rows-1) chosen simultaneously.

Timeout: The process for displaying translation results will be terminated.